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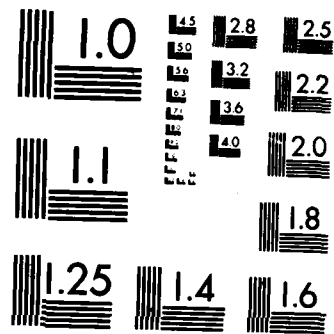
MILITARY HEARING CONSERVATION WORKSHOP DIRECTOR
HANDBOOK(U) ARMY ENVIRONMENTAL HYGIENE AGENCY ABERDEEN
PROVING GROUND MD R W DANIELSON NOV 83

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**UNITED STATES ARMY
ENVIRONMENTAL HYGIENE
AGENCY**

ABERDEEN PROVING GROUND, MD 21010

MILITARY
HEARING CONSERVATION WORKSHOP
DIRECTOR HANDBOOK

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CONTENTS

	<u>Page</u>
CHAPTER 1. SOURCES FOR TRAINING	1-1
CHAPTER 2. CAOHC (SUMMARY)	2-1
CHAPTER 3. SAMPLE AGENDAS	3-1
4 1/2 Day Workshop	3-2
3 1/2 Day Workshop	3-6
Recertification Workshop (1 Day)	3-9
CHAPTER 4. ADMINISTRATIVE PLANNING GUIDE FOR COURSE DIRECTORS	4-1
Pre-workshop Planning Guide	4-1
Onsite Planning Guide	4-5
Daily Action Guide	4-6
Last Day Guide	4-6
CHAPTER 5. SAMPLE LESSON PLANS	5-1
Description	5-1
Welcome, Scope of the Problem	5-2
Anatomy, Physiology, and Diseases of the Human Ear	5-6
Sample Student Handout (Anatomy, and Physiology of the Ear)	5-14
Sound, Psychophysics and Audition	5-19
Personal Hearing Protective Devices	5-25
Earplug Fitting Practicum	5-36
Audiometer Care and Calibration Procedures	5-39
Audiometric Techniques	5-49
Noise Hazard Evaluation	5-66
Audiometric Practicum	5-75
The Audiogram	5-80
Recordkeeping	5-85
Regulations	5-92
Health Education	5-100
The Military Hearing Conservation Team	5-103
Personal Experiences with Hearing Loss	5-105
Review: Role-playing - Application of Hearing Conservation Principles	5-108
Audiometric Practicum Examination.....	5-111

	<u>Page</u>
CHAPTER 6. STUDENT MATERIALS	6-1
Written Examination	6-1
Daily Worksheets	6-3
Workshop Critique	6-13
Sample Training Certificate	6-15
CHAPTER 7. AFTER-ACTION PLANNING GUIDE	7-1
CHAPTER 8. BIBLIOGRAPHY AND REFERENCE MATERIAL	8-1
APPENDICES.	
A - Abbreviations	A-1
B - CAOHC History	B-1
C - CAOHC Certification Requirements	C-1
D - Policy Statement of Recertification	D-1
E - CAOHC Course Outline	E-1
F - Monitoring Audiometry Referral Guide	F-1
G - Health Education Materials	G-1
H - Suggested Role-Playing Scenarios	H-1

TABLES.

1 - Function Checks - Performed Daily	5-53
2 - Microprocessor Fault Codes and Instructions	5-60

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MILITARY
HEARING CONSERVATION WORKSHOP
DIRECTOR HANDBOOK

1. PURPOSE. This handbook is designed to provide guidelines for US Army hearing conservation workshop directors conducting military training experiences equivalent to those required by the Council for Accreditation in Occupational Hearing Conservation (CAOHC). Audiometric testing conducted to support the Army's Hearing Conservation Program must be administered by a physician, an audiologist, or personnel who have documentary evidence that they are certified by CAOHC or who have received equivalent military training. This handbook can provide assistance and save time for course directors preparing workshops through its prepared lesson plans, suggested planning considerations and references.
2. SCOPE. The specific items given are based on current CAOHC and US Army requirements and are subject to change. CAOHC has been continually revising its requirements, and users to this handbook are encouraged to verify requirements given in this publication with Bio-Acoustics Division, US Army Environmental Hygiene Agency (USAEHA). Furthermore, the samples provided are intended to provide a basis for new course directors while developing their own materials; provided that CAOHC, Federal, and US Army legal and regulatory requirements are met.
3. MAINTENANCE OF MANUAL. Placing this manual in a looseleaf binder will facilitate insertion of changes or additions. Users of the manual are encouraged to submit comments and recommendations for changes. Comments should be keyed to the specific page, paragraph, and line of text for which the change is recommended. Reasons should be provided for each change to ensure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications and Blank Forms) and directed to Commander, US Army Environmental Hygiene Agency, ATTN: HSHB-OB, Aberdeen Proving Ground, MD 21010.
4. ABBREVIATIONS. A list of abbreviations is found in Appendix A, this Handbook.
5. TECHNICAL ASSISTANCE. Additional assistance and guidance in conducting hearing conservation workshops are available from the US Army Environmental Hygiene Agency by request.
 - a. CONUS requests for assistance should be addressed to Commander, US Army Environmental Hygiene Agency, ATTN: HSHB-OB, Aberdeen Proving Ground, MD 21010, with information copy to Commander, US Army Health Services Command, ATTN: HSPA-P, Fort Sam Houston, TX 78234.
 - b. Overseas requests should be addressed to HQDA (DASG-PSP), Washington, DC 20310.

CHAPTER 1
SOURCES FOR TRAINING

1. MILITARY HEARING CONSERVATION WORKSHOP.

a. In this workshop participants receive training and skills required to implement and maintain a comprehensive hearing conservation program. Subject matter includes the physics of sound, physiology of hearing, physiological effects of noise, noise measurement and analysis, hearing protective devices, engineering control of noise, audiometric techniques, recordkeeping, the care and calibration of audiometers, and procedures for establishing effective hearing conservation health education programs. Supervised practicum is provided in performing pure-tone, air-conduction hearing tests; fitting hearing protective devices; and noise measurement and analysis. This workshop meets the requirements of the Council for Accreditation in Occupational Hearing Conservation (CAOHC) and is accredited by the American Association of Occupational Health Nurses.

b. Length: 4 1/2 days

c. Location: US Army Environmental Hygiene Agency, Aberdeen Proving Ground (Edgewood Area), Maryland 21010.

d. Prerequisite: Applicants must be DA military or civilian personnel who are responsible for, or working in the fields of, health and safety. Special emphasis is given for those personnel whose duties involve the coordination of an installation level hearing conservation program.

e. Frequency: Annual

f. Sponsor: Office of The Surgeon General (Central funding available)

<u>REPORTING DATE</u>	<u>STARTING DATE</u>	<u>CLOSING DATE</u>
[Inquire at USAEHA, APG, MD; AUTOVON 584-3797, or (301) 671-3797.]		

2. OTHER SOURCES FOR HEARING CONSERVATION WORKSHOPS.

a. Many military audiologists are certified as Course Directors by the CAOHC. Periodically, they present hearing conservation workshops in their military medical treatment facilities. Contact your nearest Audiology Clinic, found in Army medical centers or major medical activities. Information on such workshops is also available from the Bio-Acoustics Division (BAD), US Army Environmental Hygiene Agency (USAEHA), AUTOVON 584-3797.

Use of company names does not imply indorsement
by the US Army, but is intended only to assist in
identification of a specific product.

November 1983

b. Periodically, workshops can be presented by personnel from BAD, USAEHA, onsite at installations requesting such services. Requests for workshops should be submitted to the Commander, US Army Environmental Hygiene Agency, ATTN: HSHB-OB, Aberdeen Proving Ground, MD 21010. Outside the US Army Health Services Command support area, requests should be made to The Surgeon General [HQDA(DASG-PSP), WASH DC 20310].

CHAPTER 2

COUNCIL FOR ACCREDITATION IN OCCUPATIONAL HEARING CONSERVATION

(SUMMARY)

Personnel conducting audiometric testing in support of US Army Hearing Conservation Programs need not be certified by CAOHC, but must have received at least equivalent military training (paragraph 9e, TB MED 501). In light of this requirement, military hearing conservation workshops are designed to at least meet criteria of CAOHC, while preparing students to use Army forms and guidelines when these students return to duty and serve as hearing conservation program coordinators. A brief history of CAOHC is provided as Appendix B, this Handbook. Certification requirements are found in Appendix C and Recertification requirements are found in Appendix D.

CHAPTER 3
SAMPLE AGENDA

When planning workshop agendas, verify current specific requirements for course content and structure, available from BAD, USAEHA, or from the CAOHC Executive Secretary. Two sample agendas are provided in this chapter which suggest organization for certification workshops. The longer (4 1/2 day) workshop is recommended whenever possible, since exposure to essential recordkeeping requirements of TB MED 501 is extremely brief in a 3 1/2 day workshop. Modifications to these sample agendas are possible to match local faculty resources and student needs. Appendix E, this Handbook, summarizes CAOHC's minimum requirements for a course agenda, which were in effect in July 1983.

SAMPLE AGENDA FOR A 4 1/2 DAY
MILITARY HEARING CONSERVATION WORKSHOP

MONDAY (DAY 1)

<u>TIME</u>	<u>PRESENTATION</u>
0830 - 0900	Registration & Administrative Announcements
0900 - 0910	Welcome
0910 - 0925	Course Objectives
0925 - 0945	Military/Industrial Noise as a Health Problem
0945 - 1045	Sound, Psychophysics and Audition
1045 - 1100	Break
1100 - 1200	Anatomy, Physiology and Disease of the Hearing Mechanism
1200 - 1315	Lunch (Individual Consultation)
1315 - 1345	Film - "Sound of Sound"/"Stick it in Your Ear"
1345 - 1445	Hearing Protective Devices
1445 - 1500	Break
1500 - 1530	Earplug Fitting Techniques
1530 - 1600	Earplug Fitting Practicum
1600 - 1615	Review - Question and Answers, Homework Assignments

TUESDAY (DAY 2)
(INCLUDES RECERTIFICATION WORKSHOP)

<u>TIME</u>	<u>PRESENTATION</u>
0830 - 0935	Audiometers, Care and Calibration (DD Form 2217)
0935 - 0950	Break
0950 - 1100	Monitoring Audiometry
1100 - 1200	Noise Measurement and Evaluation (DD Form 2214)
1200 - 1315	Lunch (Individual Consultations)
1315 - 1415	Noise Measurement Exercise (Groups I) Audiometric Practicum (Group II)
1415 - 1430	Break
1430 - 1530	Noise Measurement Exercise (Group II) Audiometric Practicum (Group I)
1530 - 1600	Film - "Stick It in Your Ear"
1600 - 1615	Review - Questions and Answers, Homework Assignments

WEDNESDAY (DAY 3)

(INCLUDES RECERTIFICATION WORKSHOP)

0830 - 0915	The Audiogram
0915 - 0930	Break
0930 - 1030	Recordkeeping - DD Forms 2215 and 2216
1030 - 1100	The Military Hearing Conservation Team: Occupational Health, Audiology, Safety and Others
1100 - 1200	Regulations Applicable to Military Hearing Conservation
1200 - 1315	Lunch (Individual Consultations)
1315 - 1415	Acoustical Engineering Controls
1415 - 1430	Break
1430 - 1615	Audiometric Practicum Using DD Form 2215
1615 -	Review - Questions and Answers, Homework Assignments

THURSDAY (DAY 4)

0830 - 0915	Health Education
0915 - 0930	Break
0930 - 1030	The Hearing Conservation Program Coordinator
1030 - 1200	Audiometric Practicum Using DD Form 2216
1200 - 1315	Lunch (Individual Consultations)
1315 - 1345	Personal Experience with Hearing Loss
1345 - 1430	Review - Questions and Answers
1430 - 1445	Break
1445 - 1615	Audiometric Practicum
1615 -	Homework Assignments

FRIDAY (DAY 5)

0830 - 0930	Review of Hearing Conservation
0930 - 1030	Examination
1030 - 1130	Hearing Conservation Techniques (Role-playing)
1130 - 1200	Group Discussion - Results of Examination
1200 -	Presentation of Certificates

Comments:

1. Classes begin at 0830 hours, to accommodate transportation requirements of local students commuting to classroom and to ensure that the faculty and facilities are prepared for the day's presentations.
2. During lunch, a faculty member should be available for students who may request personal assistance, particularly in audiometric techniques.
3. Once the agenda has been determined, all students and faculty should attempt to closely follow the schedule, as printed.

November 1983

**SAMPLE AGENDA FOR A 3 1/2 DAY
MILITARY HEARING CONSERVATION WORKSHOP**

(Note: Monday may be used for onsite preparation)

TUESDAY (DAY 1)

<u>TIME</u>	<u>PRESENTATION</u>
0900 - 0930	Registration and Announcements
0930 - 0940	Welcome
0940 - 1045	Introduction (Course Objectives) "Military/Industrial Noise as a Health Problem"
1045 - 1100	Break
1100 - 1200	Anatomy, Physiology and Disease of the Hearing Mechanism
1200 - 1300	Lunch (Individual Consultation)
1300 - 1330	Film: "Stick It In Your Ear"/"Sound of Sound"
1330 - 1430	Sound, Psychophysics and Audition
1430 - 1530	Hearing Protective Devices
1530 - 1545	Break
1545 - 1615	Earplug Fitting Techniques and Practicum
1615 -	Review, Daily Worksheets, Day 1

WEDNESDAY (DAY 2)

(INCLUDES RECERTIFICATION WORKSHOP)

0800 - 1000	Audiometers, Care and Calibration, DD Form 2217
1000 - 1015	Break
1015 - 1100	Principles of Noise Analysis, DD Form 2214
1100 - 1115	Personal Experience with Hearing Loss
1115 - 1145	Health Education
1145 - 1245	Lunch (Individual Consultations)
1245 - 1345	Monitoring Audiometry Techniques
1345 - 1445	(Group I) Noise Measurement Techniques Group II) Supervised Audiometric Practicum
1445 - 1500	Break
1500 - 1600	(Group I) Supervised Audiometric Practicum (Group II) Noise Measurement Techniques
1600 - 1615	Review - Questions and Answers, Daily Worksheets
1615 - 1645	Recertification Review, Specific Issues

THURSDAY (DAY 3)

(INCLUDES RECERTIFICATION WORKSHOP)

0800 - 0830	Recertification Review, Specific Issues
0830 - 0900	The Audiogram
0900 - 1000	Recordkeeping (Part I: DD Forms 2215 and 2216)
1000 - 1015	Break
1015 - 1045	Recordkeeping (Part II: Referral)
1045 - 1145	Federal and Military Noise Regulations
1145 - 1245	Lunch (Individual Consultations)
1245 - 1415	Supervised Audiometric Practicum, Using DD Forms
1415 - 1430	Break
1430 - 1530	The Hearing Conservation Program Coordinator in the Military/Industrial Setting
1530 - 1600	Review of Audiometric Techniques
1600 - 1615	Review of Hearing Conservation Principles, Techniques
1615 -	Daily Worksheets, Day 3

See comments, page 3-5, this handbook.

FRIDAY (DAY 4)

<u>TIME</u>	<u>PRESENTATION</u>
0800 - 0900	Review of Audiometric Techniques, Practical Examination
0900 - 1000	Written Examination
1000 - 1100	Role Playing - Application of Hearing Conservation Principles
1100 - 1145	Critique - Results of Examination
1145 -	Presentation of Certificates

RECERTIFICATION

CAOHC has prepared a policy statement on recertification of audiometric technicians (see Appendix D), which will result in requests for refresher training provided by military course directors. USAEHA guidelines for refresher workshops are also included in Appendix D. Recertification training may be provided by inviting those individuals requiring such training to 2 days within a full certification workshop (see sample agenda, above). For personnel requiring refresher training only, another alternative is to provide a single-day recertification workshop as follows:

RECERTIFICATION WORKSHOP

<u>TIME</u>	<u>PRESENTATION</u>
0800 - 0900	Regulations: Current Federal and Military Requirements
0900 - 0930	The Audiogram
0930 - 1030	Audiometric Techniques
1030 - 1130	Audiometric Practicum
1130 - 1230	Lunch
1230 - 1330	Recordkeeping
1330 - 1500	Audiometric Practicum
1500 - 1600	Roles of the Occupational Hearing Conservationist
1600 - 1700	Review of the Hearing Conservation Program

CHAPTER 4

ADMINISTRATIVE PLANNING GUIDE FOR COURSE DIRECTORS

1. PRE-WORKSHOP PLANNING GUIDE.

<u>ACTION</u>	<u>CONSIDERATIONS</u>
a. ESTABLISH NEED FOR WORKSHOP.	a. Should you present it? Should you ask some other agency to present it?
b. ESTABLISH PROJECT OFFICER.	b. Should be CAOHC-certified course director. May need assistance from local training office (funding, billeting, transportation, etc.).
c. CHOOSE DATE.	c. Allow time for adequate preparation (90 days) and onsite set up (1 day).
d. SEEK APPROVAL AND SUPPORT FOR COURSE FROM COMMAND.	d. May need resources and personnel support.
e. ESTABLISH FUNDING REQUIREMENTS.	e. Consider costs to command.
f. RESERVE CONFERENCE AND PRACTICUM ROOMS.	f. Must have adequate electrical power, comfortable seating. Quiet areas advisable for audiometric practicum.

g. REVIEW COURSE CONTENT
REQUIREMENTS.



h. DETERMINE MINIMUM AND
MAXIMUM NUMBER OF STUDENTS.



i. PREPARE AGENDA.



j. CONTACT AND CONFIRM
FACULTY MEMBERS.



k. SELECT HOUSING AND
ESTABLISH POINT OF CONTACT.



l. ANNOUNCE WORKSHOP, METHOD
OF REGISTRATION AND POINT OF
CONTACT.

g. Verify current criteria for
instructor/student ratios, class
topics, etc. as described by
recognized certifying body (CAOHC).

h. Consider number of instructors,
audiometers, and sound level
meters available. Consider size
of classrooms and housing
available.

i. Meet criteria of recognized
certifying body. Consider travel
and arrival time for students.
Plan for recertification course
within main workshop, if
required. Allow for breaks to
keep students alert.

j. Choose at least three disci-
plines (e.g., audiology, medicine,
industrial hygiene, safety, etc).

k. Choose an expert...This can be
the most unwieldy task for course
director.

l. Establish closing date (approx-
imately 2-3 weeks prior to work-
shop).

m. REQUEST APPROVAL FOR CONTINUING EDUCATION CREDITS, COURSE APPROVAL FROM RECOGNIZED CERTIFYING BODY (REQUIRES AGENDA, POSSIBLY OTHER INFORMATION).

n. ORDER CONSUMABLE SUPPLIES.

o. ESTABLISH "WORST-CASE" NEEDS FOR EQUIPMENT.

p. MAKE ARRANGEMENTS FOR RESERVING/BORROWING/SHIPPING EQUIPMENT.

q. COORDINATE HANDOUTS AND LESSON PLANS WITH INSTRUCTORS.

r. PREPARE AGENDA, HANDOUTS, EXAM, CRITIQUE AND SEND FOR DUPLICATION.

s. ORDER PUBLICATIONS, TRAINING CERTIFICATES AND REFERENCES FOR STUDENTS.

m. Members of medical, industrial hygiene and safety organizations often desire continuing education credits for professional licenses.

n. Establish "worst-case" needs for notebooks, handouts, earplugs, etc.

o. Sound level meters, audiometers, audio-visual equipment, otoscopes, ear muffs, chairs, tables, etc.

p. If more needed, contact medical depot or manufacturer for loan. Keep records of actions.

q. Send to instructors, with behavioral objectives and questions in examinations related to each instructor's topic.

r. Keep records of actions.

s. Keep records of actions.

November 1983

t. AS REGISTRATION REQUESTS ARE
RECEIVED, REVIEW REQUESTS.
DETERMINE ACCEPTANCES.

u. NOTIFY STUDENTS OF ACCEPT-
ANCE, HOUSING, LOCATION/TIME OF
FIRST CLASS.

v. VERIFY STATUS OF EQUIPMENT
AND CONSUMABLE SUPPLIES.

w. VERIFY INSTRUCTOR PREPARA-
TION STATUS.

x. ASSEMBLE COURSE MATERIALS.

y. CLOSE REGISTRATION AT
CLOSING DATE, PREPARE "EXPECTED"
ROSTER.

t. Coordinate with housing point
of contact. Consider students'
qualifications and those from
critical worksites to receive
training. Balance against spaces
available.

u. Keep records of actions. Pro-
vide estimate of housing and re-
lated costs, and cost responsi-
bilities to students. Provide
maps to housing and classroom
buildings. Notify students of
earliest possible departure time.

v. Expedite if necessary.

w. Assist if necessary.

x. (Ship ahead, if possible)
student handouts, consumable
supplies, etc.

y. Expect cancellations, last-
minute "crisis" registrations
(±10 percent of total). Prepare
waiting list or seek additional
students, as needed.

2. ONSITE PLANNING GUIDE

ACTION

CONSIDERATIONS

(Day Prior to Workshop)

a. VERIFY CLASSROOM, PRACTICUM
ROOM STATUS.

a. Check seating, training aids,
equipment storage, break areas,
emergency points of contact,
instructor/observer waiting area,
electrical power, etc.

b. CONTACT ALL INSTRUCTORS.

b. Verify times, audio-visual
support required, preparation;
discuss criteria for student
examinations; provide slides
required.

c. VERIFY HOUSING ARRANGEMENTS,
STUDENT CHECK-IN.

c. Some last-minute assistance may
be needed.

d. VERIFY MATERIALS AND SUPPLIES
STATUS.

d. Handouts, student materials,
audio-visual aid.

(First Day)

e. REGISTER STUDENTS.

e. Take roster with complete
addresses, announce criteria for
passing and course objectives.

f. INTRODUCE STUDENTS AND
FACULTY.

f. When ready, course can
commence.

3. DAILY ACTION GUIDE

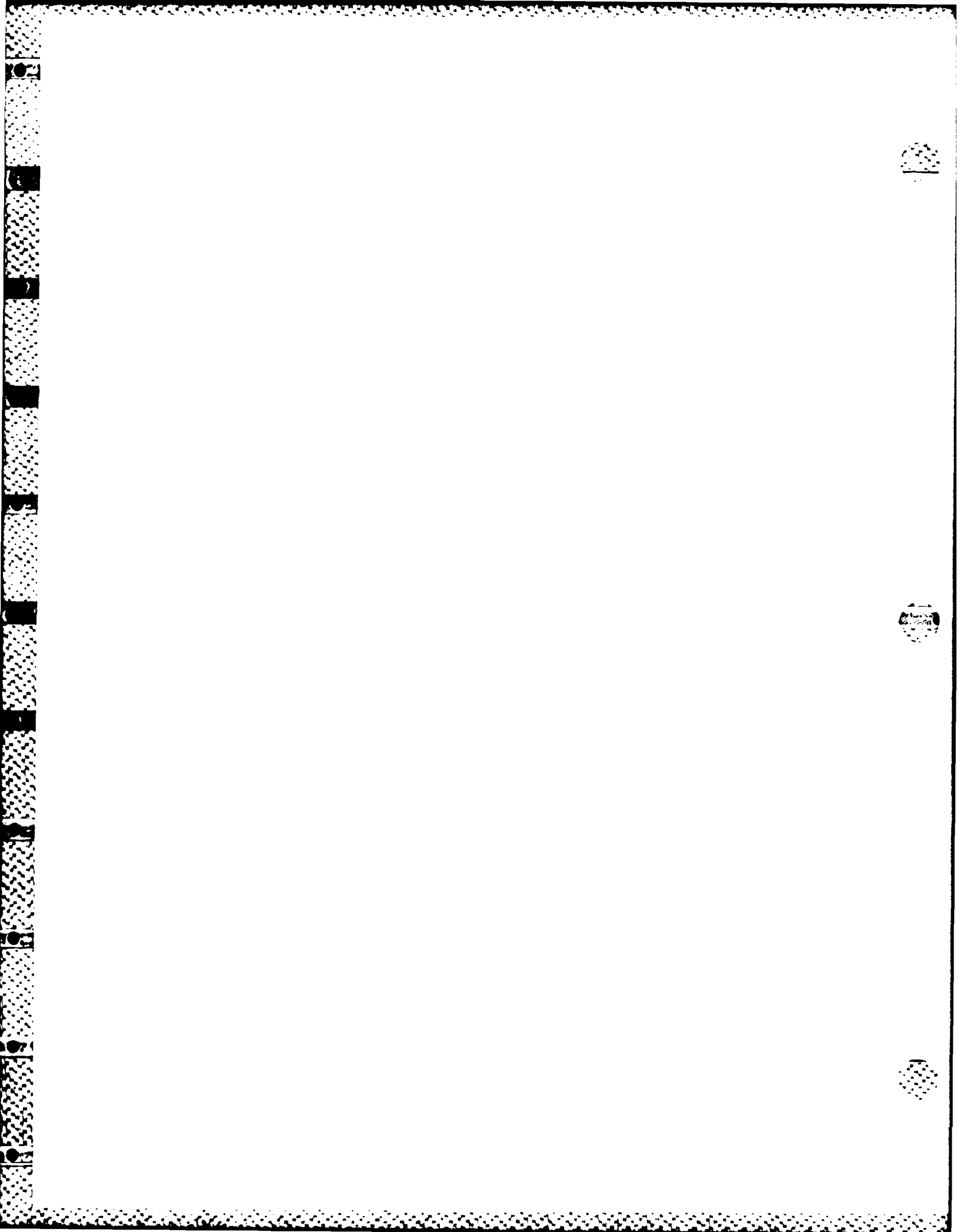
(Each Day)

- | | |
|---|--|
| a. VERIFY EQUIPMENT STATUS. | a. Check projector lamps, training aids, audiometers, etc. needed for that day. |
| b. VERIFY STUDENT MATERIAL HANDOUTS STATUS. | b. Have copies available for replacement (5% of initial total). |
| c. CONFIRM PRESENCE OF ALL STUDENTS. | c. Students must be in attendance to qualify for certification. |
| d. PROVIDE CONTACT TIME BETWEEN STUDENTS AND FACULTY. | d. Provides individual attention to local program problems. |
| e. PROVIDE CLASSROOM AIDE. | e. At least one non-teaching staff member should be available for resolving administrative and equipment problems. |
| f. STAY ON SCHEDULE. | f. Any unapproved deviation off the agenda will disrupt presentations by other staff members. |
| g. MAXIMIZE USE OF AUDIO-VISUAL AIDS, DEMONSTRATIONS. | g. Student attention and comprehension will be enhanced. |

4. LAST DAY GUIDE

- | | |
|------------------------------------|---|
| a. COMPLETE AUDIOMETRIC PRACTICUM. | a. Ensure that all students are tested in their audiometric techniques competency before final written examination. |
|------------------------------------|---|

- | | |
|--|---|
| b. PREPARE STUDENTS FOR TRANSITION FROM WORKSHOP TO HOME WORKSITE. | b. Problem solving role-playing exercises may be used. |
| c. PROVIDE CRITIQUES TO STUDENTS. | c. Evaluate all aspects, urge anonymity. |
| d. DISTRIBUTE TRAINING CERTIFICATES. | d. Have certificates prepared in advance, less approving signatures and certification numbers. Add these after examination. |
| e. PREPARE FOR EQUIPMENT RETURN. | e. Pack, label, and ship equipment with caution. |
| f. SET CONFERENCE ROOMS IN ORDER. | f. Coordinate with host facility, settle administrative details. |



CHAPTER V
SAMPLE LESSON PLANS
(DESCRIPTION)

1. Sample lesson plans are inclosed to provide the course director and faculty with outlines for each topic required within a hearing conservation workshop. Behavioral objectives express those educational objectives which each student should obtain and those tasks the student should demonstrate. The course director may provide a note-taking outline which follows the lesson plan provided (see the sample student handout for the "Anatomy, Physiology and Diseases of the Human Ear" lesson, found in this chapter, page 5-14). Student handouts are not provided for all lessons in this handbook, since the course directors using this guide will likely choose to modify presentations based on their teaching styles. If desired, student handouts may be requested from BAD, USAEHA.
2. Provide a lesson plan to guest speakers at least 30 days before the workshop to help them understand your workshop lesson objectives and to properly plan their presentations.
3. The CAOHC Manual, available at a fee from CAOHC, also contains useful background material for preparing these presentations. Keep in mind that your workshop students must receive and process a large amount of material in the few days of the training. Avoid unnecessary terminology or technical extras that will only confuse your students without increasing their effectiveness. They must understand the material presented and be able to explain it to their patients and colleagues.

LESSON PLAN

INSTRUCTIONAL UNIT: Welcome, Scope of the Problem

TYPE: Lecture

TIME ALLOTTED: 10-15 minutes

A. OBJECTIVE. Welcome to workshop participants by senior representative of sponsoring agency.

B. OUTLINE.

1. Welcome to the sponsoring facility, with short summary of the unit's mission (if not well known by all workshop participants).

2. Noise-related hearing loss; the scope of the problem in the US Army.

a. Earliest efforts to prevent hearing loss were 40 years ago; December 1941 - proposal made for establishing a research facility at Fort Knox, KY. Topics for study included the nature of temporary deafness caused by tank noise, adaptation to tank noise and effects of noise upon personal efficiency.

b. 1946 - Historical report of Armored Medical Research Laboratory at Fort Knox included the statement, "Ear protectors were found to be valuable in reducing this effect (from noise) and the recommendation that those exposed frequently be provided with protectors was implemented."

c. 1956 - First publication of Army's Technical Bulletin, "Noise and Conservation of Hearing."

d. 1965 - Military audiology officers on active duty, serving at major Army medical centers.

e. 1968 - Military audiology officer assigned to US Army Environmental Hygiene Agency (USAEHA).

f. 1969 - Bio-Acoustics Division established at USAEHA for providing consultations and advice in hearing conservation and noise abatement to Army installations.

g. 1971 - Survey report published by US Army Medical Research and Development Command showed evidence suggesting that noise-induced hearing loss is the number one health hazard to Army personnel.

h. 1975 - Final report, same subject as above, revealed substantial differences in the prevalence of hearing loss among different time-in-service groups of soldiers, with increasing hearing loss shown among those with longer time-in-service. (For example, greater than 50% of the soldiers with 15 or more years of service showed clinically significant hearing loss.)

November 1983

i. 1980 - New technical bulletin, TB MED 501, "Hearing Conservation", published with provisions to meet or exceed requirements of the current Occupational Safety and Health Act and Department of Defense Instruction 6055.3. Hearing conservation programs of other military services also structured to meet Department of Defense Instruction, with common recordkeeping forms (audiograms, noise survey records) used throughout.

j. 1980 - First audiograms received at USAEHA for inclusion within the computerized Hearing Evaluation Automated Registry System (HEARS).

k. 1982 -

(1) HEARS program was contracted, data edited and processed for examination of data trends.

(2) Sixty-seven military audiologists on active duty in the Army; assigned to medical centers and hospitals in CONUS, Europe, Hawaii, Alaska, Panama, and Korea; USAEHA; US Army Aeromedical Center; and Academy of Health Sciences.

1. Continuing problems:

(1) Although Army equipment is designed with attempts to limit noise emission, the nature of weapons and armored vehicles requires performance standards which typically do not allow state-of-the-art acoustical engineering designers to produce a "quiet" tank or howitzer. Personal hearing protection is still the key to a successful hearing conservation program. Essential support is required from medical and safety personnel.

(2) Valid and reliable audiograms are essential for an objective evaluation of the effectiveness of a hearing conservation program. From the first reference audiograms at a Military Entrance Processing Station to the termination audiogram, records must be maintained to limit the government's undue liability for hearing loss. In 1982, the Veteran's Administration paid more than \$145 million to veterans for hearing loss.

3. Summary - This workshop is intended to provide you with exposure to occupational hearing loss problems among military personnel, with emphasis on your role in audiometric testing and recordkeeping. Inasmuch as you have an opportunity to receive training in this area during this week, it is particularly essential that you be able to pass on pertinent information and use proper techniques at your local installation.

LESSON PLAN

INSTRUCTIONAL UNIT: Anatomy, Physiology, and Diseases of the Human Ear

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS: Slide projector, 35 mm slides, 8 x 10 inch anatomical charts (one per student), handouts

A. BEHAVIORAL OBJECTIVES.

1. Identify the major anatomical structures of the hearing mechanism and trace sound energy along the auditory pathway.
2. Explain the role of the outer ear, middle ear, and inner ear in the transmission of sound.
3. Given a site of lesion for a hearing disorder, determine if such a disorder is likely to be a conductive or sensori-neural hearing loss.

B. DISCUSSION.

1. Anatomy.

a. Outer ear - auricle, ear canal, bone:

- (1) Auricle - aids in localization, helps direct high frequencies to the eardrum.

(2) Ear canal - has resonant characteristics to emphasize acoustic energy in the speech range, contains cerumen to keep canal clean and moist, skin lining is very delicate and sensitive, varies in size and shape.

(3) Bone - outer one third of ear canal is surrounded by cartilage and inner two thirds by bone.

b. Eardrum - vibrates to set middle ear bones in motion, changes acoustical energy to mechanical energy.

c. Middle ear - ossicles (malleus, incus, and stapes), Eustachian tube:

(1) Ossicles - mechanically amplify sound, protect inner ear from loud sounds via the acoustic reflex.

(2) Eustachian tube - equalizes pressure in the middle ear with atmospheric pressure.

d. Inner ear - semi-circular canals, cochlea, acoustic nerve:

(1) Semi-circular canals - mechanism for sense of balance.

(2) Cochlea and acoustic nerve - change mechanical/hydraulic energy into neural impulses; when stapes pushes in, a wave is formed; stimulating hair cells, starting an electrochemical reaction. A neural impulse is sent up the acoustic nerve to the brain.

2. Physiology - Pathways of Sound.

a. Air conduction: Process of conducting sound waves through ear canal, through middle ear to inner ear.

b. Bone conduction: Process of conducting sound energy directly to inner ear. Suspect cross-over when thresholds in either ear differ by 50-70 dB at the same frequency in audiometric testing.

3. Characteristics of Hearing Loss.

a. Conductive disorders - Result from any dysfunction of the outer or middle ear in the presence of a normal inner ear. In most cases, such losses can be corrected through medical or surgical treatment.

(1) Symptoms:

(a) Soft speaking voice.

(b) Ability to discriminate speech when presented at a comfortably loud level.

(c) Generally demonstrates a flat hearing loss or a greater loss in the low frequencies.

(2) Etiology in external ear:

(a) Blockage of the external auditory canal by excessive accumulation of cerumen, or foreign objects such as cotton.

(b) Congenital atresia.

(c) External otitis - infection or inflammation.

(3) Treatment of external ear disorders:

(a) Removal of cerumen plug or foreign object.

(b) Possible surgical intervention to open canal - or hearing aid.

(c) Medication, under physician's care.

(4) Etiology in middle ear:

(a) Otitis media - infection or inflammation of middle ear - most common cause of conductive hearing loss in children - conveniently classified by its effect on the tympanic membrane.

(b) Cholesteatoma - a cystic mass which usually grows from a marginal perforation of the tympanic membrane.

(c) Otosclerosis - a disease that affects the bony capsule surrounding the inner ear.

(5) Treatment of middle ear disorders - Medical treatments include use of medication or surgery.

b. Sensori-neural impairments - hearing loss resulting from pathology of the inner ear (cochlear lesion) or the auditory nerve (retrocochlear lesion) in the presence of a normal outer and middle ear. Typically, such losses cannot be corrected through medical or surgical treatment.

(1) Systems and characteristics.

(a) May use inappropriately loud voice - patient does not have normal hearing by bone conduction since the problem is in the inner ear; therefore, he does not hear his own voice normally.

(b) May demonstrate reduced ability to discriminate speech presented at a comfortably loud level. Consonant sounds characterized by high frequencies and weak energies (s, sh, ch, th, f, and k) are easily confused because they may not be heard.

(c) Usually hears better in low frequency range with greater hearing loss in the higher frequencies; may hear voices (vowels and acoustically strong consonants) adequately if low frequency hearing is not significantly impaired, so shouting does not help and may even hinder understanding of speech.

(d) Does not hear well in noise surroundings.

(e) Tinnitus - often reported as constant and higher in pitch than that described by the person with a conductive loss.

(2) Etiology. Injury to the inner ear may result from:

(a) Mechanical injury - fracture of the temporal bone may disorganize the Organ of Corti. Any severe blow to the side of the head (auto accident, battle injury, etc.) may produce sensori-neural hearing loss.

(b) Noise exposure can cause irreversible damage to the hair cells of the Organ of Corti.

(3) Hearing loss resulting from noise exposure is classified as acoustic trauma or noise-induced.

(a) Acoustic trauma - injury to the ear by a single exposure to intense sound such as an explosion or gun blast.

November 1983

(b) Noise-induced hearing loss - loss of hearing that develops gradually over a period of exposure to intense levels of noise. The region of the basilar membrane corresponding to frequencies above 2000 Hz seems to be the most vulnerable to the effects of noise. A 4000 Hz dip typically signifies noise-induced loss. Although the higher frequencies are affected first, hearing loss will extend to frequencies below and above 4000 Hz with prolonged exposure...thus affecting speech frequencies more. Temporary threshold shift is a temporary hearing loss resulting from limited exposure to intense noise. Hearing sensitivity may be recovered after a period of rest (usually 18 hours). If not, it is likely to be a permanent threshold shift. Once noise-induced hearing loss is manifested, the hearing mechanism remains vulnerable to permanent threshold shifts. It is vital that measures be taken to protect the ears from further noise exposure.

c. Mixed hearing loss - a sensori-neural (cochlear or retrocochlear) disorder along with a conductive (outer or middle ear) disorder.

d. Nonorganic hearing loss - the cause of the demonstrated or exaggerated hearing loss is not organic. Nonorganic hearing problems may result from malingering or psychogenic factors.

(1) Conscious feigning, simulation, or exaggeration of a hearing impairment is termed malingering, which may occur:

(a) For monetary or other personal gain.

(b) To escape assignments or responsibilities.

(2) Less common is the unconscious development of a nonorganic loss as a compensatory or protective device. In this psychogenic problem, the patient believes the impairment is real.

SAMPLE STUDENT HANDOUT
ANATOMY AND PHYSIOLOGY OF THE EAR

A. The ear is anatomically divided into three parts:

1.

2.

3.

B. The ear is physiologically divided into two parts. Disorders can result in:

1. Conductive hearing loss: the damage is located in: _____

_____.

2. Sensori-neural hearing loss: the damage is located in: _____

_____.

C. The Outer Ear.

PARTS ON CHART: AURICLE, EAR CANAL, BONE

1. Functions.

a. Directs high frequency sounds to the eardrum.

- b. Helps determine from which direction sound is coming or _____.
 - c. Keeps ear canal clean and moist.
2. Disorders.
- a.
 - b.
 - c. Occlusion with foreign objects.
 - d. Collapsed ear canal.

D. The Eardrum.

PARTS ON CHART: EARDRUM

1. Functions.
- a. Vibrates to set middle ear bones in motion.
 - b. Changes acoustical energy to mechanical energy.

2. Disorders to the eardrum are ruptures or perforations caused by:

a.

b.

E. The Middle Ear.

PARTS ON CHART: OSSICLES, EUSTACHIAN TUBE

1. Functions.

a. Mechanically amplifies sound.

b. Equalizes pressure in the middle ear with atmospheric pressure.

c. Protects inner ear from loud sounds through the acoustic reflex.

2. Disorders.

a.

b.

c.

d. Disarticulation of ossicles.

e. Cholesteotoma.

F. The Inner Ear.

PARTS ON CHART: SEMI-CIRCULAR CANALS, COCHLEA, ACOUSTIC NERVE

1. Function - changes mechanical/fluid energy into electro-chemical neural impulses.

2. Disorders of the inner ear are caused by:

a. Mechanical injury.

b.

G. Pathways of sound.

1. Air Conduction.

2. Bone Conduction - bypasses the outer ear.

H. Characteristics of Hearing Loss.

1. Conductive.

a. Decreased hearing sensitivity at _____.

b. Usually correctable.

2. Sensori-neural.

a. Decreased hearing sensitivity at _____ first.

b. Poor speech discrimination.

c. Usually permanent.

3. Noise-induced hearing loss is of the _____
type and usually affects _____ first.

LESSON PLAN

INSTRUCTION UNIT: Sound, Psychophysics and Audition

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS: Chalk board, 35 mm slides, slide projector and screen, tuning forks

A. BEHAVIORAL OBJECTIVES.

1. Given a list of physical acoustic terms, appropriately relate them to physiological auditory aspects in studies of noise measurement and control, audiometry and hearing protection.

2. Identify units of measurement used for quantifying frequency and sound pressure.

B. DISCUSSION.

1. Definition of sound - an organized movement of molecules (wave form) which are capable of producing an auditory sensation in an organism [if that organism is able to hear within that frequency spectrum and at the sound pressure level (SPL) of that sound].

2. List requirements for sound; e.g., matter, energy, elasticity, inertia, minimal friction and an ear capable of hearing.

3. "If a tree falls on a deserted island, is there sound?" This so-called classical philosophical argument results from a failure to appreciate the objective and subjective aspects of sound, i.e.:

*Physical (Objective) Acoustic Aspects	Physiological (Subjective) Auditory Aspects.
+a. sound pressure (intensity) (decibel, dB)	1. loudness (sones and phons)
+b. frequency (hertz, Hz)	2. pitch (mels)
c. wave composition (spectrum)	3. timbre (quality)
d. time (phase)	4. duration

* Easiest aspect to measure + Found on the dials of an audiometer

4. Propagation of Sound Energy.

a. Energy is propagated, but matter is not.

(1) "Billiards" analogy.

(2) "Relay race in individual cells" analogy.

- b. Compression (area of high pressure).
 - c. Rarefaction (area of low pressure).
 - d. Sine wave - schematic of pressure changes.
5. Frequency, measured in hertz (formerly cycles per second) 20 - 20,000 Hz is considered range for normal human hearing.
6. Sound Pressure (intensity). Related to amplitude of displacement.
7. Decibel Notation.
- a. Logarithmic ratios:
 - (1)
$$\text{dB} = 20 \log_{10} \frac{P}{P_2} \quad \frac{2000 \text{ } \mu\text{bars}}{.0002 \text{ } \mu\text{bars}}$$
 - (2)
$$\text{dB} = 20 \log_{10} \left(\text{consider } \frac{\$100}{\$1} \right)$$
 - b. Reference levels for 0 dB sound pressure level (SPL):
 - (1) .0002 dyne/cm²
 - (2) .0002 μ bar
 - (3) 20 μ Pa (used in Federal Register)
 - (4) 20 μ N/m²

8. Thresholds for steady-state noise:

- a. Discomfort = 120 dB SPL.
- b. Pain = 140 dB SPL.
- c. Tissue damage = 160 dB SPL.
- d. Death = 180 dB SPL (estimated level).

9. Human Sensitivity vs Acuity.

10. Nonlinearity of Human Ear.

- a. 0 dB HTL occurs at different levels of SPL at different frequencies.
- b. Implications for audiogram review - does 0 dB mean no sound is present?

11. Weighting networks on a sound level meter; e.g., A, B and C.
Explain briefly.

12. Noise.

a. Physical definition:

(1) Hazardous noise (determined by level).

(a) Steady noise - 85 dBA.

(b) Impulse noise - 140 dBP.

(2) Music vs noise:

(a) Noise consists of irregular, nonrecurring, aperiodic vibrations, but so are consonant sounds that carry intelligibility of speech. Musical sounds are regular, recurring, periodic vibrations but could be hazardous, depending on level.

(b) Subjective definition: unwanted sound, determined by situation and lack of information content.

13. Octave Bands.

a. Definition:

(1) See ANSI S1.6-1967 for preferred series.

November 1983

(2) Band Width - $.707 \times$ center frequency for lower end and twice value for upper end.

b. Purpose - to determine sound energy distribution according to frequency.

c. One-third and one-tenth octave bands.

d. Combining Octave bands (see Appendix B, TB MED 501).

LESSON PLAN

INSTRUCTIONAL UNIT: Personal Hearing Protective Devices

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS, EQUIPMENT, AND MATERIALS: (one per student) Technical Guide 041 (MED), Personal Hearing Protective Devices - Fitting, Care and Use, January 1975, Posters, 35 mm slides and samples of hearing protectors under discussion

A. BEHAVIORAL OBJECTIVES.

1. List all types (and sizes) of hearing protective devices available in the Federal supply system which are approved by The Surgeon General.
2. Discuss the advantages and disadvantages of earplugs and ear muffs.
3. Demonstrate a proper earplug fitting technique for single- and triple-flange preformed earplugs.
4. Demonstrate proper insertion techniques for preformed and handformed earplugs.
5. Given an "alibi" for not wearing hearing protection, provide an appropriate response for education of the wearer.

6. Provide instruction on the care and use of hearing protection.

B. DISCUSSION.

1. Types of Approved Hearing Protective Devices and Related Equipment.

- a. Nonstandard. (NOT APPROVED).

- (1) Fingers (bi-digital earplugs).

- (2) Palms.

- (3) Pencil erasers, cotton, etc.

- b. Approved earplugs (medical items).

- (1) Preformed earplugs require a medical fit. Sizing distributions will depend upon age, sex and race of population with a shift toward the small sizes if more young people, females and blacks are included (note color coding of earplugs).

- (a) Single-flange (5-10 percent have different sizes between ears):

- (i) extra small (white) - 5 percent

- (ii) small (green) - 25 percent

- (iii) medium (orange) - 40 percent
- (iv) large (blue) - 20 percent
- (v) extra large (red) - 10 percent

(b) Triple-flange (easiest to fit):

- (i) small (green) - 20 percent
- (ii) regular (orange) - 60 percent
- (iii) large (blue) - 20 percent

(2) Handformed:

(a) Yellow/white foam - limitations exist for extremely small ear canals and dirty work environments.

(b) Silicone - performs exceptionally well in extreme temperature, danger of piece breaking off if rolled too small.

(c) Cotton - wax impregnated (interest withdrawn because of poor performance and poor user acceptance).

c. Circumaural Protectors (Ear Muffs).

(1) Type I (interest withdrawn by The Surgeon General's Office).

(2) Type II (3 head positions possible).

(3) Those with electronic communication capability.

d. Ear Canal Caps - increased user acceptance, minimal noise reduction but good for intermittent exposures. May be worn in two or three different positions.

e. Helmets:

(1) Aviator's Helmet, SPH-4 (good maintenance record).

(2) Combat Vehicle Crewman's Helmet, DH-132 (50-70 percent not serviceable).

(a) Management problem - not individually fitted although available in 3 sizes, not assigned to an individual.

(b) Problems - no seals, hardened seals and no chin straps.

2. Choice of Protectors.

a. Issued gratis.

b. Freedom of choice from among approved protectors recommended unless medically or environmentally contraindicated.

c. Advantages of Plugs vs Muffs (see page 25-27 in Technical Guide 041).

d. Disadvantages of Plugs vs Muffs (see page 25-27 in Technical Guide 041).

3. Earplug Carrying Case (with Earplug Seating Device)
(NSN 6515-01-100-1674).

- a. Purpose - storage and hygiene.
- b. Also issued gratis.
- c. Nonreflective and translucent (storage).
- d. Earplug seating device - increases protection provided by earplugs, since they are more likely to be inserted correctly.

4. Noise Reduction Characteristics ["cover on the book" lab
(experimenter fit) vs field (user fit) data].

- a. Cotton (None).
- b. Earplugs (better in low frequencies).
- c. Ear muffs (better in high frequencies).
- d. Most standard protectors have better reduction over 1000 Hz.

e. Earplugs and ear muffs worn in combination.

(1) Criterion for steady-state noise (108 dBA).

(2) Criterion for impulse noise (165 dBP).

(3) Over 118 dBA (worn in combination with time limits).

5. Maintenance Procedure.

a. Ear muffs.

(1) Seals and other sources of leaks.

(2) Suspension system tension must be maintained.

(3) Avoid "adding" material to earcups or any other modifications.

(4) Ozone deteriorates foam lining.

b. Earplugs.

(1) Clean with soap and water, rinse off, dry.

(2) Check annually for sizing and deterioration.

6. Earplug Fitting Procedure.

a. Occlusion Effect.

(1) Sensation - one's own voice sounds low-toned.

(2) Increased awareness of tinnitus.

b. Inspection of Ear Canals.

(1) Technique - pull ear out and down.

(2) Ear infections should be recognized. If present, earplug insertion inadvisable.

(3) Impacted wax - normal build up, is an insect repellent, helps prevent infections, and traps foreign particles.

(4) Overcome "Mommy's instilled fear of inserting anything in ears."

c. Ear Gauges (see NSN in Technical Guide 041).

(1) Purpose - assists fitting process by showing fitter (especially inexperienced personnel) general size of external ear opening.

(2) Limitations - still need a trial plug.

d. Triple-flange (fit first, particularly when many fittings required in limited time).

(1) Characteristics of a good fit and seal:

(a) Two flanges have entered the ear canal.

(b) Third flange is blocking entrance to ear canal, i.e., no room between flange and ear canal.

(c) Tension on stem exists.

(2) Limitations:

(a) Crooked ear canal.

(b) Extreme sizes (extra small or extra large).

e. Single-flange.

(1) Characteristics of a good fit and seal:

(a) Blocking ear canal.

(b) Tab is to the rear.

(c) Tension on tab exists.

(2) Limitations:

(a) Extreme sizes.

(b) Funnel-shaped ear canal.

f. Earplug Fitting Kit - purpose and advantages.

(1) Followup for earplug fitting done outside the medical facility.

(2) Save manhours.

(3) Effective demonstration technique, if a noise source is present.

g. Comfort.

(1) Important factor for rejection.

(2) Break-in period required (new shoes analogy).

(3) Smaller size that seals will increase comfort.

h. Communication with Hearing Protection.

(1) More research required to fully understand this issue.

(2) Signal-to-voice ratio concept is critical. In general, workers raise their voices when in a noisy environment. There is a tendency for workers to reduce their voice levels when wearing hearing protection.

(3) Over-loading (sunglasses analogy). Hearing protection, like sunglasses, reduces excessive stimuli (blare/glare) and allows a person to better concentrate upon specific items.

(4) A tape demonstration with white noise (95 dBA) may prove to class students this concept of communication in noise.

(5) However, there are limitations of improved speech discrimination:

(a) Under 85 dBA - Less intelligibility with hearing protectors.

(b) Over 130 dBA - Too loud for unamplified speech, reaches limits of hearing protectors.

(c) Hearing sensitivity of listener - Hearing loss decreases speech discrimination ability.

(d) Type of hearing protector - Too much protection will limit intelligibility, e.g., double protection.

(e) Spectrum of noise - Higher levels of high frequency noise are more disruptive.

(f) Nature of speech material - Less redundant material is more affected.

(6) Localization abilities with earplugs vs ear muffs - No difference occurs if individuals can turn their heads.

(7) Protective mask (M17A1/A2) - Voice directional, need to look at person to be heard with hearing protection.

(8) Tuning engines - Modern mechanics use instruments now; are saving their hearing by "listening" with hearing protection worn.

LESSON PLAN

INSTRUCTIONAL UNIT: Earplug Fitting Practicum

TIME ALLOTTED: 30 minutes

TYPE: Laboratory

TOOLS:

1. For each student: one pair each of: triple-flange (3 sizes), single-flange (5 sizes), foam disposable, and silicone earplugs.
2. For each six students: one otoscope with specula, alcohol swabs.
3. Posted in classroom: posters showing instruction for fitting earplugs, proper/improper earplug fittings.

A. BEHAVIORAL OBJECTIVES.

1. Given a variety of single- or triple-flange earplugs, select correct size of earplug and correctly fit earplugs for a worker.
2. Given an individual wearing earplugs which have not been seated correctly or which are the wrong size, take corrective actions.
3. Provide proper verbal instructions for inserting earplugs and checking adequacy of fit for a group of individuals.

B. DISCUSSION.

1. This practicum follows lectures in hearing protective devices and earplug fitting techniques.

2. Students are given a variety of all sizes of all earplugs available in Federal supply system. They first select a partner and perform an otoscopic examination of the external ear canals, checking for ear drainage, foreign bodies, or excessive cerumen. The shape and direction of the ear canal is observed to aid student techniques in proper selection of earplugs.

3. Using their partner, students will seek a correct fit with earplugs of the correct size in all types of earplugs provided. The students will judge a correct fit as:

a. All earplugs: Sensation of occlusion; i.e., voice sounds muffled or lower in pitch, increased awareness of tinnitus.

b. Triple-flange earplugs: Tension on stem and plug blocking entrance to the ear canal.

c. Single-flange earplugs: Tab to the rear, tension on tab and plug blocking entrance to the ear canal.

4. Instructors will circulate among students and check all earplug fittings and approve/recommend changes. Each student will require approval of the earplug fitting performed.

5. After students' fittings have been checked, they may keep the earplug varieties provided (one pair each size, style) for later reference at their duty station.

6. As a second practicum, students can be tasked with identifying improper earplug sizes or seating, as typically found at worksites. Approximately three to five students (or faculty) can be selected to intentionally wear earplugs incorrectly (e.g., not inserted into ear canal far enough, earplug too small). Other students will pass by and closely observe each subject, then go to an instructor and report the problem seen and correction required. This exercise is intended to train students to be thorough in their evaluation of hearing protection being worn in a typical fashion by workers, since an earplug placed in an ear canal may have such an acoustic leak as to provide minimal attenuation.

LESSON PLAN

INSTRUCTIONAL UNIT: Audiometer Care and Calibration Procedures

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS: Manual audiometer, microprocessor audiometer, self-recording audiometer, chalk, chalkboard, handouts.

A. BEHAVIORAL OBJECTIVES.

1. Identify basic switches and controls on audiometers.
2. Perform five function checks on manual audiometers.
3. Identify requirements for audiometer calibrations.

B. JUSTIFICATION. Students need to recognize audiometer switches and controls used during audiometric testing and essential equipment care procedures. Calibration requirements must be known to audiometric equipment operators. Routine checks of audiometer functions can identify any potential equipment problems which may compromise audiometric test results.

C. DEFINITION. The audiometer is an electronic instrument used to assess hearing function through the use of calibrated, pure-tone signals of known intensity, frequency, and duration.

D. TYPICAL SWITCHES AND CONTROLS. All audiometers usually have these functions. Look for them, whether your audiometer is black/blue/brown or looks very different from example shown.

1. Manual audiometers:

- a. Power switch (on-off).
- b. Attenuator (Intensity Control).
- c. Frequency selector switch.
- d. Earphone selector switch.
- e. Interrupter bar.
- f. Pulse-tone, continuous-tone switch (Optional).
- g. Normally-on/normally-off switch (Optional).

2. Self-recording audiometers:

- a. Power switch.
- b. Start test switch.
- c. Trial or table hold button.
- d. Mid-delay switch (optional).
- e. Validity check switch (optional).
- f. Pulse-tone, continuous-tone.

3. Microprocessor audiometers. May also have a printer (separate or self-contained). (As manufacturers continue to develop, instrumental controls may vary.)

- a. Power switch.
- b. Start/resume test switch.
- c. Stop test switch.
- d. Pulse-tone, continuous-tone switch.
- e. Manual/automatic choice control.
- f. Print command.
- g. Test enable switch.

E. CARE AND MAINTENANCE OF THE AUDIOMETER.

1. General: Warm up for approximately 15 minutes. Leave audiometers on until completion of the last hearing test of the day. A dust cover should be in place when the audiometer is not turned on (at night, on weekends). With care, an audiometer should meet its life expectancy of 10 years.

2. Care of earphones.

a. Do not place earphones face down on any surface. Do not force the cushions together. Such an action could tear diaphragm with suction.

b. Store headset by hanging on a secure hook to prevent hard blows when dropped.

c. If the earphones receive a hard blow, biological calibration check should be performed before further testing.

d. NEVER REVERSE OR EXCHANGE EARPHONES FROM ONE AUDIOMETER TO ANOTHER.

e. Earphones should be identified by serial number or station number to the appropriate audiometer.

3. A list of function checks to be conducted daily is provided as table 1.

F. CALIBRATIONS.

1. Electroacoustic.

a. Performed annually.

b. Audiometers must meet calibration standards specified in ANSI S3.6, 1969.

TABLE 1. FUNCTION CHECKS - PERFORMED DAILY

	<u>MANUAL</u>	<u>MICROPROCESSOR</u>	<u>SELF-RECORDING</u>
1. <u>Earphones</u>			
a. Check cushions - Free of cracks?			
Resilient?	X	X	X
b. Check headband tension.	X	X	X
c. Check cords - Should have no fraying, cracking or loose connections.	X	X	X
2. <u>Earphone Cords</u>			
a. Listen to tone, as cord is twisted at earphone jacks (at booth and/or at audiometer), at connection to earphone, and entire length of cord.			
(1) With tone at 60 dB, 1000 Hz.	X	N/A	N/A
(2) During presentation of signal at level "easy to hear" during listening check.	N/A	X	X
b. Repeat in opposite earphone.	X	X	X
c. If the tone "cuts out" or if a scratchy sound is heard, the cord must be replaced.	X	X	X
3. <u>Intensity check.</u>			
Listen for steady increase in intensity at any frequency:			
a. As attenuator is rotated from 0 dB HL to 60 dB HL. Repeat in opposite earphone.	X	N/A	N/A

	<u>MANUAL</u>	<u>MICROPROCESSOR</u>	<u>SELF-RECORDING</u>
b. As intensity level is allowed to increase 40-50 dB. (Do not depress patient response switch). Repeat in opposite earphone.	N/A	X	X
4. <u>Frequency Check.</u> Listen for presence and quality of all frequencies:			
a. As frequency selector dial is rotated through all frequencies, one ear.	X	N/A	N/A
b. During biological calibration, listen for six frequencies per ear.	N/A	X	X
5. <u>Interrupter Switch and Signal Distortion Check.</u>			
a. No scratchy or humming noises should occur when attenuator is turned to high intensity levels. Repeat in opposite earphone.	X	N/A	N/A
b. Interrupt signal, listen for smooth onset/offset. No audible sound should occur when signal is off, with no clicks.	X	N/A	N/A
c. (Checks on microprocessor and self-recording audiometers are difficult.)	N/A	X	X

MANUAL MICROPROCESSOR SELF-RECORDING

6. Cross-Talk.

Cross-talk is occurring if an audible tone is heard in the earphone not being used. (This is not crossover which occurs when sound energy passes through the skull, from the deaf ear to the hearing ear.)

a. Disconnect one earphone jack. Turn earphone selector switch to the earphone you have disconnected and listen to opposite earphone for an audible tone. (Should NOT occur.) Repeat in opposite earphone.

X

N/A

N/A

b. Since both earphones are connected to a single jack, one earphone jack cannot be disconnected. Check for potential cross-talk when listening during audiometry by pulling one earphone away from head while listening to opposite ear. Signal should not be occurring simultaneously in both ears.

N/A

X

X

c. Performed on a regular schedule by personnel from US Army
Medical Materiel Agency:

(WEST COAST)

DEFENSE DEPOT TRACY

ATTN: SGMMA-MD-C

Tracy, CA 95376

AUTOVON 462-9391

(EAST COAST)

TOBYHANNA ARMY DEPOT

ATTN: SGMMA-MD-P

Tobyhanna, PA 18466

AUTOVON 247-9612/9744

d. When calibrated, audiometer will be labeled with either USAMMA
Form 134T (old) or DA Form 2163 (new).

2. Biological.

a. Performed weekly for all audiometers, following instructions
given in Appendix H, TB MED 501.

b. One DD Form 2217 per listener is used to record data from
biological calibration of each audiometer.

c. At least two trained listeners are tested to obtain a baseline
audiogram. Listeners should have known stable hearing threshold levels
that do not exceed 25 dB at any test frequency.

d. The DD Form 2217 is used for recording all weekly biological calibration checks and is substituted by a new DD Form 2217 when:

(1) The listener is no longer available for further weekly duty as the listener, and a different listener is used.

(2) The audiometer is electroacoustically calibrated.

(3) No more room exists for entries on that DD Form 2217.

(4) A different audiometer replaces the audiometer at that station.

e. At least two DD Forms 2217 are maintained for each audiometer.

f. The DD Form 2217 should have proper identifying information for each audiometer, including serial number.

g. If a difference of greater than ± 5 dB is noted at any test frequency by comparing the listener's baseline thresholds and the current audiogram (the lowest entry on the page), the discrepancy must be accounted for. If not explained, the audiometer should be sent for repair and calibration within 30 days.

EXAMPLE:	<u>PASS</u>	<u>FAIL</u>	<u>500 Hz</u>
6 Jul 82 -			5 dB
XXX			XX
5 Oct 82		(fail)	15 dB

h. If a discrepancy is noted, but can be explained (e.g., by a listener's head cold), it should be noted in "Remarks" section of DD Form 2217. The second listener for that audiometer should be tested to assure that the audiometer's signal output is consistent with the second listener's baseline.

i. If a discrepancy is noted, but cannot be easily explained except by a change in audiometer output, the equipment must be repaired. (A discrepancy such as this cannot just be noted on DD Form 2217 and testing allowed to continue.)

G. REPAIRS. Repairs are requested through the local Bio-Medical Maintenance Activity at the nearest MEDDAC hospital. A DA Form 2407, Maintenance Request, is completed for the audiometer. If the audiometer has malfunctions beyond the repair capability of the local medical maintenance shop, the instrument will be forwarded to the nearest Medical Equipment Maintenance Division. Such an action may require a lengthy loss of the audiometer from your mission, so BE CAREFUL WITH ALL AUDIOMETRIC EQUIPMENT to extend the usability of your equipment.

LESSON PLAN

INSTRUCTIONAL UNIT: Audiometric Techniques

TYPE: Lecture

TIME ALLOTTED: 1 1/2 hours

TOOLS: Monitoring Audiometry Handout, Vu-graph of audiometer dial and screen

A. BEHAVIORAL OBJECTIVES.

1. Demonstrate an accurate hearing check using a manual, a self-recording and a microprocessor audiometer.

2. Identify variables that can affect audiometric results.

B. DISCUSSION.

1. Purpose of monitoring audiometry.

- a. Detect noise-induced hearing loss and monitor overall effectiveness of hearing conservation program.

- b. Indicate the effectiveness of a hearing conservation program, particularly hearing protection.

2. All personnel exposed to hazardous noise require periodic audiometric testing.
3. Criteria for hearing test accuracy.
 - a. Quiet testing environment.
 - b. Accurate equipment.
 - c. Trained technician.
 - d. Well instructed, cooperative examinee.
4. Manual audiometer controls - power switch, frequency, attenuator dial, interrupter switch, earphone selector switch, and pulse-tone mode.
5. Procedure for testing with a manual audiometer.
 - a. Set up.
 - (1) Are all listening, biological, and electroacoustical calibrations up to date?
 - (2) Power on - warm up audiometers with vacuum tube circuits.

(3) Fill out audiogram - DD Form 2215 for reference audiogram, DD 2216 for periodic, 90-day, or termination audiogram.

b. Seat and instruct examinee.

(1) Seat with profile facing you.

(2) Instructions must be memorized (see Figure 1).

(3) Familiarize examinee with test tones if never tested before.

(4) Ask the person if he has better hearing in one ear than in the other.

(5) Start with the better ear. Inform the person which ear will be tested first.

(6) Ask the examinee if he/she has any questions.

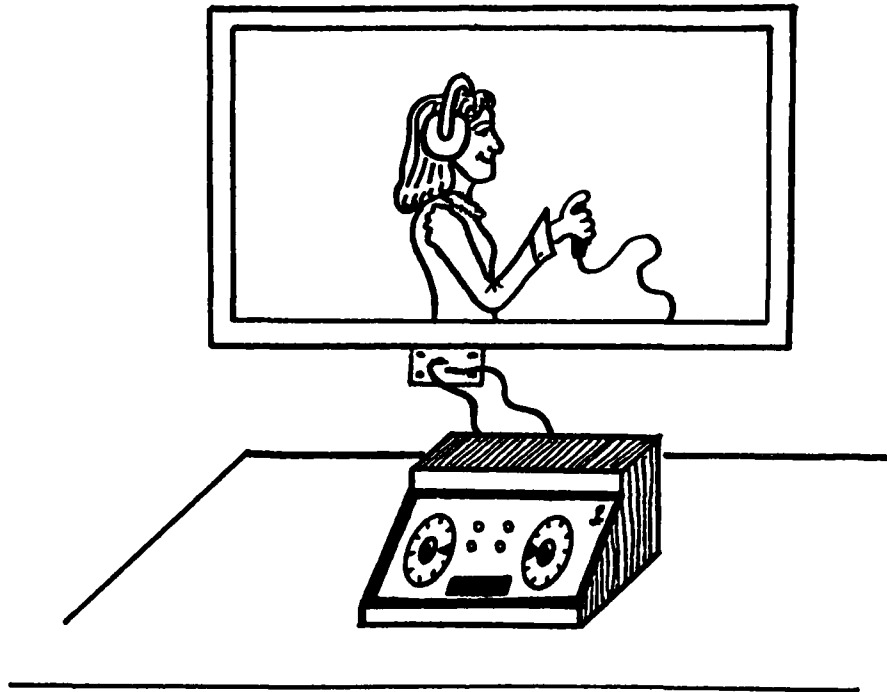
c. Place earphones.

(1) Check earphone tension.

(2) Remove glasses, earrings, chewing gum, earplugs, and hearing aids. Push hair behind the ears.

AUDIOMETRIC INSTRUCTIONS

MANUAL/SELF-RECORDING AUDIOMETRY



1. THIS IS A HEARING CHECK. YOU WILL BE LISTENING FOR SOME TONES.
2. EACH TIME YOU HEAR A TONE, PRESS THE BUTTON. WHEN THE TONE GOES AWAY RELEASE THE BUTTON.
3. NO MATTER HOW FAINT THE TONE, PRESS THE BUTTON WHEN YOU HEAR THE TONE, AND RELEASE THE BUTTON WHEN THE TONE GOES AWAY.
4. UPON COMPLETION OF YOUR HEARING CHECK, PLEASE REMAIN SEATED AND QUIET UNTIL THE OPERATOR RELEASES YOU.

FIGURE 1. AUDIOMETRIC INSTRUCTIONS MANUAL/SELF-RECORDING AUDIOMETRY

(3) Place red on the right ear, blue on the left. Make sure diaphragm is seated over concha. Adjust headband.

(4) Drape cord down the person's back.

d. Check audiometer controls - ear selector on appropriate ear, pulse-tone mode on, tone selector in "normally off" position, attenuator dial at 0 dB HL, frequency dial at 1000 Hz.

e. Initial sweep response - hold interrupter switch down and turn the attenuator up slowly until the person responds. Release interrupter switch.

f. Initial response check - wait 2 seconds, then press the interrupter switch down again and hold for 1 second. If person responds, continue on to bracketing technique. If not, continue initial sweep up.

g. Bracketing - discrete movements of down 10 dB when the person hears the tone, and up 5 dB when the person does not hear the tone until the person responds two times at any level (the initial sweep response cannot be counted).

h. Record threshold. Record output limits of the audiometer if no response at a frequency.

i. Frequency order: 1000, 2000, 3000, 4000, 6000, 1000, 500 Hz.
The second check at 1000 Hz must agree within ± 5 dB of the first check or the test must be started over. Record the lower threshold if within ± 5 dB.

j. Test opposite ear - no need to recheck 1000 Hz in this ear.

6. Procedure for testing with a self-recording audiometer.

a. Set up - same as a manual but:

(1) Place card on audiometer table.

(2) Push audiometer table "in".

b. Seat and instruct the individual. Self-recording audiometers usually test the left ear first.

c. Place earphones - same as manual.

d. Set the various switches - pulse-tone, mid-delay, validity check and test.

e. To let the person practice, use the trial or table-hold button until the pen's excursions do not exceed 20 dB.

f. Release the table-hold button to begin the test.

g. Mid-delay switch.

(1) When to use: Routinely.

(2) Purpose: Stops table after 6000 Hz is tested in the left ear to allow a sufficient number of tracings at 500 Hz in the right ear.

h. Validity check.

(1) When to use: When excursions are less than 5 dB.

(2) Frequency: 3000 Hz.

(3) Valid test: Spike.

(4) Invalid test: Does a tracing occur consistent with the rest of the tracing? - start over.

i. Determine the validity of the audiogram: six tracings must cross a line drawn through the center (midline) of the tracings and parallel to the frequency axis at each frequency. Excursions should exceed 20 dB, to be considered valid.

j. Record threshold by averaging the midline of the excursions to the nearest 5 dB.

7. The procedures for using a microprocesor audiometer are as follow. Bracketed portions refer to use of banked microprocessors. (This text is best used with the banked microprocessor audiometers, now used in MEPS facilities).

a. Set up - same as manual [if anything but the station number is displayed during power up, do not use].

b. Seat and instruct the individual(s) - technique is same as manual, plus:

(1) If testing a group and not all banks will be used, select the station numbers that will be used.

(2) Microprocessors start with the right ear first in the automatic mode.

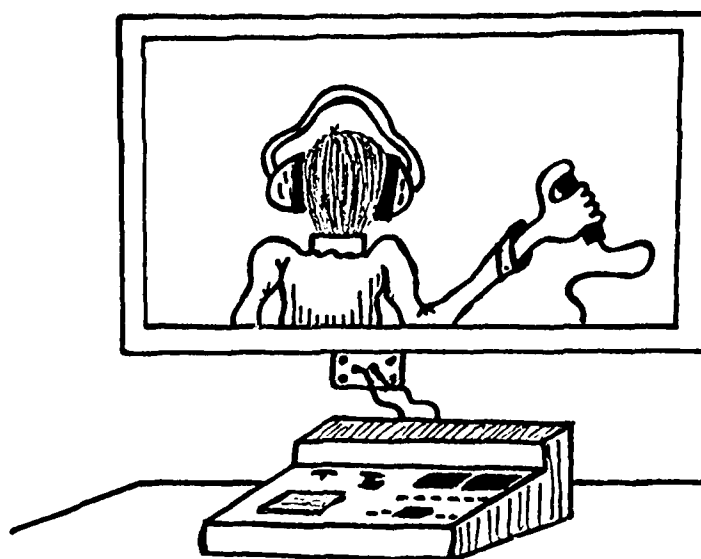
(3) Instructions become very important. See Figure 2.

(4) The importance of responding quickly should be emphasized since the person will have only approximately 2 seconds to respond.

c. Place earphones - same as manual.

November 1983

AUDIOMETRIC INSTRUCTIONS MICROPROCESSING AUDIOMETRY



1. THIS IS A HEARING CHECK. YOU WILL BE LISTENING FOR SOME TONES.
2. EACH TIME YOU HEAR A TONE, PRESS THE BUTTON AND QUICKLY RELEASE THE BUTTON.
3. NO MATTER HOW FAINT THE TONE, PRESS THE BUTTON WHEN YOU HEAR THE TONE. AND, QUICKLY RELEASE THE BUTTON WHEN THE TONE GOES AWAY.
4. UPON COMPLETION OF YOUR HEARING CHECK, PLEASE REMAIN SEATED AND QUIET UNTIL THE OPERATOR RELEASES YOU.

FIGURE 2. AUDIOMETRIC INSTRUCTIONS MICROPROCESSING AUDIOMETRY
5-57

d. For banked units, press the group button. An A will be displayed.

e. Set the pulse-tone button.

f. Press two buttons to begin the test - "test enable," then "test."

g. The microprocessor will:

(1) Obtain thresholds - the microprocessor uses a different technique than the manual procedure we use. It will begin each frequency at 40 dB HL, and increase in 10 dB steps until the person responds or decrease in 20 dB steps until the person fails to respond. Then, the audiometer will present the next tone after a variable amount of time, using the down 10 dB, up 5 dB technique, until the person responds three times on an ascending presentation. It will then test the next frequency.

(2) Recheck 1000 Hz - this is done for both ears.

(3) Perform seven validity checks.

(4) Automatically print out the results when the test is valid.

h. If a fault code is tripped:

(1) Push the station number on the console.

(2) The person must be reinstructed. See Table 2. Press the push-to-talk button and reinstruct according to the fault code.

(3) Press the resume button. Note that if "test enable", "test" are pushed, the test will start over and you will lose all previous data.

i. If a "manual retest" is indicated, you can select only the ear and the frequency to be tested.

j. Record thresholds - always record the lower of the two thresholds at 1000 Hz for each ear.

8. Causes of audiometric variability.

a. Physiological causes.

(1) General health of examinee, especially head colds.

(2) Temporary threshold shift.

(3) Tinnitus.

(4) CROSS-OVER - if the threshold in one ear differs by 50-70 dB from the threshold in the opposite ear, suspect cross-over.

TABLE 2. MICROPROCESSOR FAULT CODES AND INSTRUCTIONS (TRACOR RA411 AND
AUTOTECH GRS-1 AUDIOMETERS)

FAULT CODE

<u>TRACOR</u>	<u>AUTOTECH</u>	
---------------	-----------------	--

E-1	11	No response at 1000 Hz
-----	----	------------------------

Problem: At 1000 Hz, the tone level reached a level of 100 dBHL with no response from the examinee. A profound hearing loss in both ears may exist but it is more probable that the examinee does not understand the test. Reinstruct and continue the test.

INSTRUCTIONS: "You are not pushing the handswitch when you hear the tone. If you can hear the tone, push your handswitch one time --- if you cannot hear the tone, push your handswitch twice. I will restart the test. Remember to push and release the handswitch as soon as you hear the tone."

E-2	22	Failed - No validation at 1000 Hz
-----	----	-----------------------------------

Problem: At 1000 Hz, too much time elapsed and the examinee did not respond three times at the same sound level. The examinee probably does not understand the procedure. Reinstruct and continue the test.

INSTRUCTIONS: "Press and release the handswitch button as soon as you hear a tone, even if the tone is very soft."

FAULT CODE

TRACOR AUTOTECH

E-3 33 Failed 1000 Hz retest

Problem: Each ear is tested twice at 1000 Hz and the test and retest thresholds must be compatible. Retest thresholds were not within plus or minus 5 dB of the original threshold. If this fault occurs in the right ear, start the test over. If it occurs in the left ear, first reinstruct and continue the test. Then, if this fault code recurs in the left ear, start the test over from the beginning. If testing a group, wait until the group finishes to start over.

INSTRUCTIONS: (First time, left ear) "Press and release the handswitch button as soon as you hear a tone, even if the tone is very soft.

(First time, right ear; or second time, left ear- individual)
Present same instructions as above and start the test over.

(First time, right ear; or second time, left ear- group) "Sit quietly and I will retest you when the group finishes." Then present the same instructions as above and start the test over.

FAULT CODE

TRACOR AUTOTECH

E-4 44 No release of the handswitch button

Problem: The examinee is not releasing the handswitch button after responding to a tone. Reinstruct and continue the test.

INSTRUCTIONS: "You are not releasing the handswitch quickly enough. Remember to press and release the handswitch quickly, as soon as you hear the tone."

E-5 66 Responding when no tone present

Problem: The examinee has responded at a time when no tone was being presented. Reinstruct and continue the test.

INSTRUCTIONS: "You are pushing the handswitch when no tone is present. Be sure you hear the tone and press and release your handswitch quickly."

E-6 77 No validation on one or two frequencies

Problem: Except for one or two frequencies, the test is valid but at the missed frequencies, manual retesting is indicated.

Procedure: Switch to manual mode and administer a manual test at the missed frequencies.

FAULT CODE

TRACOR AUTOTECH

E-7 88 Failed to validate at three frequencies
Problem: Too much time elapsed and the examinee did not respond three times at the same sound level at more than two test points, so the entire test should be administered in the manual mode.

INSTRUCTIONS: (Individual) Reinstruct the individual on the entire test procedure. Begin the test again.

INSTRUCTIONS: (Group) "Sit quietly and I will retest you when the group finishes." Then follow the same procedure as for an individual.

E-8 Unidentified audiometric error. Used on partial printouts.
Not acceptable as a threshold.

Equipment problem. Repair audiometer.

b. Psychological causes.

- (1) Comprehension of instructions.
- (2) Motivation of patient.
- (3) Attentiveness of patient.
- (4) Patient's experience in taking hearing tests.

c. Methodological causes.

- (1) Instructions to the individual.
- (2) Earphone placement.
- (3) Auditory and visual cues by tester.
- (4) Rhythmic presentation of tones by tester.
- (5) Recordkeeping errors (reversing ears).

d. Physical causes.

- (1) Ambient noise level in testing environment.

- (2) Ventilation and lighting in testing environment.
- (3) Equipment variables - calibration, good repair.

LESSON PLAN

INSTRUCTIONAL UNIT: Noise Hazard Evaluation

TYPE: Lecture, demonstration

TIME ALLOTTED: 1 hour

TOOLS: Overhead projector, Vugraph transparencies, screen, sound level meters (at least one for every three students), DD Forms 2214 (one for each student).

A. BEHAVIORAL OBJECTIVES.

1. Describe basic components and type classification of sound level meters.
2. Operate a Type 2 sound level meter to obtain steady noise data.
3. Describe sound level meter calibration criteria and schedules.
4. Identify factors affecting or altering noise level readings.
5. Prepare a DD Form 2214, Noise Survey, with applicable risk assessment codes.

B. LECTURE OUTLINE-NOISE HAZARD EVALUATION.

1. Why performed: To confirm the existence of noise hazards, to document that problem and to trigger the implementation of a Hearing Conservation Program.

2. When performed:

a. At all previously designated noise-hazardous areas, at least once a year.

b. At noise-hazardous areas with any change in operation which affects noise levels (within 30 days of change).

c. At any other areas suspected to be noise-hazardous, where noise makes it difficult for two people, with good hearing, to converse at close range or wherever noise hazards are otherwise suspected.

3. Who performs: Trained AMEDD personnel (certified Hearing Conservationist or Industrial Hygienist).

4. How performed:

a. Sound Level Meter.

(1) Calibrated noise measuring device which meets criteria of ANSI Standard S1.4-1983.

(2) Components:

- (a) Transducer (better known as the microphone).
- (b) Amplifier.
- (c) Weighting networks (to be discussed later).
- (d) Display meter, may be either a needle, or in newer models, light emitting diode (LED), or liquid crystal display (LCD).
- (e) Slow-fast averager.

(3) Type classifications:

- (a) Type 1 - Precision Laboratory: Very stringent tolerances, expensive.
 - (b) Type 2 - General Purpose: Tolerances are not as stringent as a Type 1, is adequate for most measurements required for hearing conservation program. Sound level meters MUST MEET THE REQUIREMENTS OF ANSI STANDARD S1.4-1983 AND CAN USUALLY ONLY MEASURE STEADY NOISE.
 - (c) Type 0 - Laboratory Standard.
- b. Acoustical Calibrator (Pistonphone). Calibrated device which produces a standard known signal for verifying calibration of sound level meters before and after noise level measurements.

5. Weighting networks: Used by sound level meter to respond more to certain frequencies than others, allowing the meter to have a sensitivity similar to that of the human ear. The A scale network is not sensitive to the very low frequencies, but the C scale network is sensitive to all frequencies. If a measurement is higher on the C scale than on the A scale, the noise likely has a significant low frequency component. (Your role as a hearing conservationist will not require octave band analysis.)

6. Sound level meter switches and indicators:

- a. On-off switch.
- b. Battery check switch.
- c. Network selector.
- d. Fast-slow meter response selector.
- e. Attenuator
- f. Indicating meter.

C. EXPOSURE CRITERION - STEADY NOISE (para 5b, TB MED 501).

D. EXPOSURE CRITERION - IMPULSE NOISE (para 5c, TB MED 501). Sound level meters must be able to measure peak of impulse noise accurately, be capable of displaying measurements greater than 140 dB peak, and have a minimum crest factor of 25 dB.

E. CONDUCTING THE NOISE HAZARD EVALUATION.

1. Investigate the nature of work done in area, determine best representative measurements.

2. Operational pre-checks.

a. Check for visual damage to meter.

b. Check batteries, connection and strength.

c. Calibrate with acoustic calibrator pistonphone.

3. Operational procedures for use.

a. Set weighting switch to "dBA".

b. Set meter response to "slow".

c. Adjust meter range switch until display (needle or digital) is within meter range.

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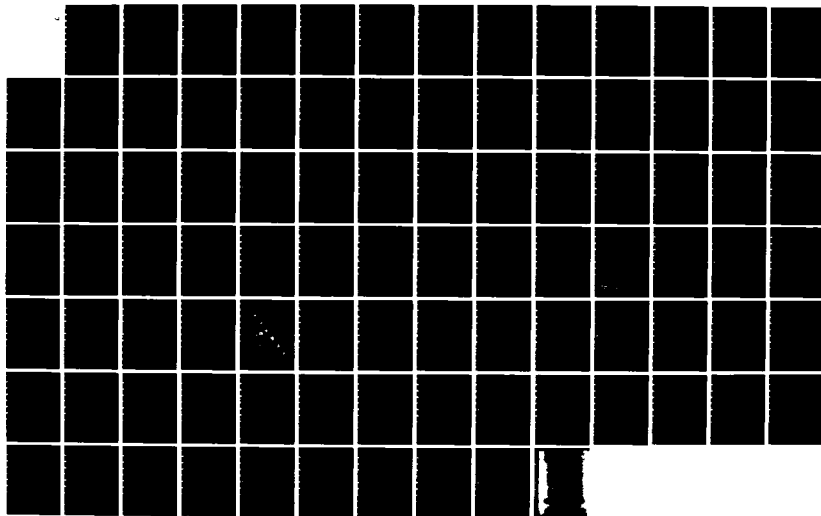
MILITARY HEARING CONSERVATION WORKSHOP DIRECTOR
HANDBOOK(U) ARMY ENVIRONMENTAL HYGIENE AGENCY ABERDEEN
PROVING GROUND MD R W DANIELSON NOV 83

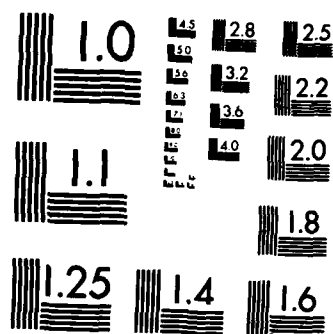
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

- d. Read meter.
- e. Add meter reading to range setting.
- f. Be alert to detect measurement errors.
- g. Recalibrate after use.

4. Factors affecting or altering noise level readings.

- a. Body baffle.
- b. Wind, temperature, humidity.
- c. Microphone size.
- d. Criteria used for determining noise level:

(1) Needle swing.

(2) Position of microphone...Should always be at worker's ear, not placed where worker's head wouldn't go (i.e., next to fan).

5. Electroacoustic calibration.

- a. Required at least annually.

b. Performed through one of two methods:

(1) Manufacturer's contract.

(2) Through Biomedical Maintenance to US Army Missile Command,

ATTN: DRSMI-MD, Redstone Arsenal, AL 35898.

6. Care of the Sound Level Meter.

a. Do not turn on and off unnecessarily.

b. Replace weak batteries.

c. Adjust if out of calibration or send it back to the factory for repair.

d. Do not expose to:

(1) Excessive heat (115° F.).

(2) Moisture.

(3) Hard blows or abuse.

(4) (Microphone) Excessive dust.

(5) Exceptional electromagnetic fields.

F. DD Form 2214, Noise Survey (use form as Vugraph transparency) student should follow Appendix A, TB MED 501.

1. Identifying information:

a. Date; type of survey; manufacturer, model serial number, and date of last electroacoustic calibration for SLM; microphone; and calibration used.

b. Describe area and or specific duty, sound level data.

c. List individuals to be included in hearing conservation program and their supervisor.

2. Risk Assessment Code (Appendix C, TB MED 501).

3. Danger Signs and Decals - Noise-hazardous areas and equipment must be posted with danger signs, as described in AR 385-30.

4. Hearing Protection - Required.

a. Steady noise - Levels of 85 dBA or greater require at least one form of hearing protection. Exposures to levels above 108 dBA require earplugs and ear muffs together. Exposure to noise levels above 118 dBA requires that hearing protection be worn in combination and that a limitation be placed on daily exposure time.

b. Impulse noise - Levels above 140 dBP require hearing protection. Levels above 165 dBP require double hearing protection.

LESSON PLAN

INSTRUCTIONAL UNIT: Audiometric Practicum

TYPE: Practicum with demonstration as required

TIME ALLOTTED: 2 1/2 hours

TOOLS: Audiometers (manual, microprocessor, self-recording), tables/work surfaces, electrical outlets, supply of DD Forms 2215 or 2216, "quiet" areas for teaching and testing, audiometric instruction posters.

Optional: Audiometer simulators (electronic programmable models and/or audiometer dial faces).

A. BEHAVIORAL OBJECTIVES.

1. Without notes, verbally provide standard audiometric instructions, as presented in class.
2. Demonstrate a proficiency in using the threshold-seeking technique using audiometer, as presented in class.
3. Given a series of invalid or unreliable audiometric test results, identify the errors made by the audiometric technician.

B. TECHNIQUES FOR PRACTICUM.

1. Initial Practicum.

a. Have students group into pairs, one pair per audiometer or audiometer dial face. All students should be within arm's reach of an audiometer and able to see dial faces. Ask them to locate basic audiometer dials common to all audiometers. Point out any excess dials not related to air-conduction monitoring audiometry (e.g., microphone, bone conduction, masking dials).

b. Ask students to repeat standard audiometric instructions, as provided in class, until they are familiar with instructions.

c. Have students perform actual listening checks of their audiometer, as presented in "Audiometer Care and Calibration" class.

d. Begin hands-on audiometric practice by having students:

(1) Place earphones correctly.

(2) Start with correct frequency, intensity setting, ear; and use the pulse tone, if available.

(3) Use proper threshold-seeking technique using manual audiometer and a listening patient.

(4) Operate a self-recording or microprocessor audiometer while testing a listening patient.

(5) Record thresholds on a standard audiogram (DD 2215, 2216).

2. Later in practicums, have students:

a. Change partners and roles (testers become listeners).

b. Use different audiometers.

c. Simulate abnormal audiograms by placing an earplug in the ear canal prior to audiometry.

d. Record data and provide a completed DD Form 2215 for the patient tested. Provide copy No. 1 to patient, who will give it to a later tester for use in "retesting" and for completing DD Form 2216.

e. Simulate tinnitus for all listeners by presenting a signal loudly enough to be audible to all students in the room. The source for the signal could be an audiometer with earphones placed upon a table surface and operated at 100 dB HL at 2000 or 4000 hertz, or a sound level meter acoustical calibrator turned to 2000 hertz and placed upon a table.

f. Allow excessive background noise levels in the room to be present, demonstrating effects upon low frequency thresholds.

g. Use "coaching techniques".

"Coaching techniques" enable students to be challenged in advanced audiometric practicum by simulating hearing losses which represent patients tested in actual hearing conservation programs. In this technique, one student is the tester and another student is the "patient". The "patient" reads a pre-chosen audiogram which may show any type of possible hearing loss. The tester proceeds using standard techniques. The significant exception here is that the "patient" need not wear the earphones and must be allowed to observe the audiometer dial face easily. During the testing, the "patient" will respond whenever the stimulus is presented above the given audiogram's thresholds. Likewise, the patient will fail to respond when the presentation is below the given thresholds. In this manner, both students in the pair have an active part in audiometric techniques. The "patient" is closely observing the tester's method and thus serves as a full-time assistant instructor. This coaching technique maximizes the use of training time by presenting hearing test results that do not represent "normal" hearing yet which may occur in typical monitoring audiometry.

3. Establish and announce objectives for audiometric practicum at the beginning of the first practicum. Current CAOHC criteria require 150 minutes of supervised audiometric techniques and 60 minutes of audiometric techniques review. Such a time frame would allow students to perform a minimum of:

- a. Two hearing tests, testing an actual listening patient.
- b. Two hearing tests, serving as a listening patient.
- c. Three hearing tests, conducted on an individual who was "coaching".
- d. Three hearing tests, serving as a "coach."

LESSON PLAN

INSTRUCTIONAL UNIT: The Audiogram

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS, EQUIPMENT, AND TRAINING MATERIALS: Slides and Vugraphs

A. BEHAVIORAL OBJECTIVES.

1. Identify three different types of audiograms and their uses.
2. Given a set of audiometric results, describe proper patient disposition, as described in TB MED 501.
3. Given a set of hearing test results affected by ambient noise problems, identify those affects upon audiometric thresholds.

B. JUSTIFICATION. Students need to be able to interpret, know typical applications, and determine validity of all types of audiograms. Proper audiogram interpretation is essential for proper patient disposition.

C. DEFINITION. An audiogram is a record of the threshold of sensitivity of each ear for each of several pure-tone frequencies.

D. EXPLANATION.

1. General information required for all audiograms:

- a. Patient's name, SSN, MOS/SSI, job location.
- b. Examiner's name, SSN, certification number.
- c. Date of test.
- d. Make, model, serial number of audiometer.
- e. Calibration date of audiometer.

2. Types of audiograms.

a. Serial.

- (1) Hearing thresholds recorded numerically to the nearest 5 dB.
- (2) Used on DD Forms 2215/2216 and MEPS physical, SF 88 (sometimes used by clinical audiologists.)
- (3) Generated by microprocessor audiometers.

b. Graphic.

(1) Provides a graphic representation of hearing thresholds as a function of frequency and intensity.

(2) Primarily for clinical use by audiologists and physicians.

(3) Uses symbols instead of numbers.

c. Self-recording.

(1) Continuous saw-tooth tracings generated by Tracor ARJ-4 (4A, 4B, 4C).

(2) Determining threshold:

(a) Draw horizontal line through excursion mid-points.

(b) Round off value to nearest 5 dB.

(3) Validating criteria:

(a) Six intersections of horizontal line by tracing line.

(b) Excursions may not be greater than 20 dB.

(4) Attach card to audiogram/physical form.

(5) Generally becoming obsolete; being replaced by microprocessors.

d. Forms used in hearing conservation program:

(1) DD Form 2215 - Reference or baseline audiogram.

(a) Preplacement/pre-employment audiogram for civilians.

(b) Entrance audiogram upon entrance to military.

Audiogram must be H-2 (per AR 40-501) or better:

25 dB or better at .5, 1, 2 kHz and 55 dB or better at 4 kHz

or 20 dB or better at .5, 1, 2 kHz and 35 dB or better at 4 kHz

in the better ear.

(2) DD Form 2216 - Used for annual, 90-day termination audiograms.

(3) Disposition of forms: #1 original to health record

#2 copy to HEARS repository (USAEHA)

#3 copy to local suspense file

3. General information.

a. Maintain audiograms for period of employment plus 5 years.

b. Tests must be performed by audiologist, physician, person certified by CAOHC, or one who has received equivalent military training.

c. Trained personnel must review all audiograms for validity and proper patient disposition.

d. A physician or audiologist will review all audiograms indicating a requirement for additional testing, such as a significant threshold shift (± 20 dB or more from reference).

e. Factors affecting validity:

(1) False recordings by tester - pattern of thresholds, thresholds following H-1 limits (per AR 40-501).

(2) Mid-delay switch and validity check button in self-recording audiometers.

(3) Poor test environment, affecting lower frequencies.

(4) Cross-over.

(5) Uncooperative patient.

(6) Failure to record better thresholds at 1 kHz (original vs recheck).

LESSON PLAN

INSTRUCTIONAL UNIT: Recordkeeping

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS: Vugraph projector and transparencies, DD Forms 2214, 2215, 2216,
2217, handouts, TB MED 501

A. BEHAVIORAL OBJECTIVES.

1. Explain the medical legal importance of proper recordkeeping procedures in a hearing conservation program.
2. Using data given, accurately complete:
 - a. DD Form 2217, Biological Audiometer Calibration Check.
 - b. DD Form 2214, Noise Survey.
 - c. DD Form 2215, Reference Audiogram.
 - d. DD Form 2216, Hearing Conservation Data.
3. Describe proper patient disposition within a hearing conservation program.

B. DISCUSSION.

1. Accurate recordkeeping is critically important to hearing conservation program, in that it provides:

a. Records which are medical-legal documents, subject to review in compensation claims.

b. Documentation for use by hearing conservation team personnel available to judge the effectiveness of the hearing conservation program.

c. Records are subject to review by governmental representatives (especially in civilian industries).

2. Types of Records Required.

a. Records of biological calibration, DD Form 2217 (Biological Audiometer calibration check).

(1) When completed: Weekly, two listeners per audiometer, one form per listener.

(2) Pass-fail criterion: ± 5 dB of baseline audiogram at any frequency.

(3) Any discrepancy must be accounted for or the audiometer should receive electroacoustic calibration within 30 days.

b. Records of physical (electroacoustic) audiometer calibration, (DD Form 2163).

(1) Completed by: Depot calibration team.

(2) When completed: Annually.

(3) Not the responsibility of audiometric testing station, but hearing conservationist/audiometric technician should check to ensure that calibration is not overdue.

c. Noise Surveys (DD Form 2214).

(1) Completed by: Industrial hygiene, preventive medicine or audiology (qualified AMEDD) personnel.

(2) When completed: At least annually, and within 30 days of any change in operation affecting noise levels.

d. DD Form 2215, Reference Audiogram (see Appendix F, this handbook).

(1) May be done as pre-employment or preplacement audiometric tests or may use results of MEPS audiometric testing.

(2) Where no DD Form 2215 exists in the health record, prepare one using the earliest valid audiogram available. In most cases, that may be the current audiogram since information may be incomplete from past audiograms.

(3) Must be preceded by period of at least 15 hours without noise exposure capable of inducing shift in hearing.

(4) Must have no apparent ear, nose or throat problems.

(5) Referral made if:

(a) Average HTL of more than 25 dB at 500, 1000, 2000 Hz;

or (b) Abrupt loss of more than 55 dB at 3000, 4000, or 6000 Hz for either ear.

(6) Go through format item by item.

(7) Must be retained for 30 years beyond the period of enlistment or employment.

e. DD Form 2216, Hearing Conservation Data (see Appendix F, this Handbook).

(1) When used (periodic/annual):

(a) First periodic, approximately 90 days after beginning work in a noise-hazardous area.

(b) No extraordinary measures (e.g., no requirement for 15 hours in noise-free environment) to be taken.

(c) If no significant threshold shift (STS), check hearing at least annually. STS is defined as a cumulative shift of ± 20 dB or more at any one of the following frequencies: 1000, 2000, 3000 or 4000 Hz in either ear. Neither 500 nor 6000 Hz are considered. If STS occurs, the following steps must be taken:

(i) Notify the individual and supervisor of the threshold shift.

(ii) Schedule a follow-up audiogram to be performed after 15 hours in a noise-free environment.

(iii) If the threshold shift is confirmed, notify the individual and supervisor of the need for a second follow-up audiogram.

(iv) The second follow-up audiogram should be preceded by 40 hours in a noise-free environment.

(v) If the threshold shift is confirmed, notify the individual and supervisor of the permanent threshold shift, and refer the individual for an audiological and otologic evaluation. This evaluation should be done within 30 days. If the individual is transferred to another installation before the evaluation is completed, the need for such an evaluation should be noted in the individual's health record. If indicated, a profile for hearing loss must be issued to military personnel at this time. Report the hearing loss as an occupational illness to the installation safety manager.

(vi) A new reference audiogram (DD Form 2215) must be established at this time. The old reference audiogram will be maintained in the individual's health record.

(d) If no STS is noted, or if STS essentially returns to the levels of the reference audiogram, the individual must be reinstructed in the essentials of hearing conservation and returns for periodic audiometric testing.

(e) Personnel regularly exposed to unusually high noise levels should be tested more frequently.

(f) A termination audiogram is required of all military personnel and those civilians who were assigned to noise-hazardous areas, before the termination date of enlistment or employment.

(g) Records must be retained for 30 years beyond the period of enlistment or employment.

(h) Go over each item of DD Form 2216.

LESSON PLAN

INSTRUCTIONAL UNIT: Regulations

TYPE: Lecture

TIME ALLOTTED: 1 hour

TOOLS, EQUIPMENT, AND MATERIALS: Slides, projector, handouts, Tech Guide 042,
TB MED 501's, and MEPCOM Reg handout
(MEPCOM courses only)

A. BEHAVIORAL OBJECTIVES.

1. Identify major support regulations to the US Army Hearing Conservation Program.
2. Identify the five major program areas of the hearing conservation program as outlined in TB MED 501.

B. LECTURE OUTLINE.

1. Noise is any unwanted sound.
2. Historical examples of noise legislation:
 - a. Roosters kept out of Sybaris.
 - b. Chariots in Rome could only be driven during certain hours.

3. Ramazini is known as the father of occupational health. He wrote about noise affecting copper workers as early as 1700.

4. Federal noise legislation began in 1960 with the Walsh-Healy Public Contracts Act. Only contractors with more than \$10,000 worth of business with the Government were affected.

5. The Occupational Safety and Health Act of 1970 states:

a. Employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to his employees.

b. Each employer shall comply with the occupational safety and health standards promulgated under this Act.

c. Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

6. OSHA rules for occupational noise exposure were published in 1974 and were amended in 1983.

7. Executive Orders make OSHA applicable to Government agencies:

a. The following section of 29 CFR 1960.17 provided the authority for DA adoption of a noise exposure standard more stringent than the OSHA standard:

Executive Order 11807 requires that the head of each Federal agency establish procedures for the adoption of agency occupational safety and health standards, and that these agency standards be "consistent" with the standards promulgated by the Secretary of Labor . . . For the purpose of this subpart, standards are "consistent" with OSHA standards if they provide protection to employees which is at least as effective as the protection provided by the OSHA standards.

b. The Federal Register, Vol. 45, No. 40, contained the supplanting Executive Order 12196 which states that

The head of each agency shall:

- Furnish the employees places and conditions of employment that are free from recognized hazards that are causing or are likely to cause death or serious physical harm.

- Comply with all standards issued under section 6 of the Act, except where the Secretary approves compliance with alternative standards. When an agency head determines it necessary to apply a different standard, that agency head shall, after consultation with appropriate occupational safety and health committees where established, notify the Secretary and provide justification that equivalent or greater protection will be assured by the alternate standard.

- Assure prompt abatement of unsafe or unhealthy working conditions. Whenever an agency cannot promptly abate such conditions, it shall develop an abatement plan setting forth a timetable for abatement and a summary of interim steps to protect employees. Employees exposed to the conditions shall be informed of the provisions of the plan. When a hazard cannot be abated without assistance of the General Services Administration or other Federal lessor agency, an agency shall act with the lessor agency to secure abatement.

- Assure that periodic inspections of all agency workplaces are performed by personnel with equipment and competence to recognize hazards.

- Provide safety and health training for supervisory employees, employees responsible for conducting occupational safety and health inspections, all members of occupational safety and health committees here established, and other employees.

8. DOD Instruction 6055.3, Hearing Conservation, 8 June 1978, provides authority for the Army Hearing Conservation Program. In addition, the DOD Instruction is designed to standardize programs within DOD.

9. TB MED 501 is the implementing Army document for the DODI.

- a. Noise Hazard Evaluation and Exposure Criteria.
- b. Engineering Control Measures.
- c. Hearing Protective Measures.
- d. Medical Control Measures.
- e. Health Education, Supervision.

10. The authority for TB MED 501 is AR 40-5, 25 September 1974, Chapter 4, Section IV.

- a. Hazardous Noise Levels.
 - (1) Steady-state noise: greater than or equal to 85 dBA.
 - (2) Impulse noise: greater than 140 dBP.

b. Program Functions.

(1) Evaluation of known or suspected noise hazards by trained AMEDD personnel.

(2) Posting of areas.

(3) Elimination of noise hazards through engineering controls.

(4) Provision of hearing protection.

(5) Provision of periodic audiometric testing.

(6) Provision of health education.

(7) Command support for program.

c. Individual Installation Supplements to AR 40-5.

SUPPORT REGULATIONS

11. AR 385-10, 1 February 1979 - Delineates the responsibility for the supervision of the Occupational Safety and Health Act (1970) and the Army Hearing Conservation Program to the Army Director of Safety.

12. AR 385-30, 15 September 1983 - Provides specifications for danger signs which are required for posting hazardous areas.
13. AR 385-32, 1 May 1982 - Provides information and responsibilities for providing safety equipment, e.g., hearing protection.
14. AR 385-40, 1 September 1980 - Provides information and procedures for accident and incident reporting and recordkeeping.
15. AR 385-63, 22 February 1978 - Delineates policies and procedures for firing ammunition for training, target practice, and combat.
16. AR 420-70, 17 November 1976 - Provides responsibilities for provision, erection, and maintenance of safety (danger) signs and authorization for acoustical treatment.
17. CPR 700, 12 March 1973, Change 14, Chapter 751.A - Provides Table of Penalties for civilian employees for various offenses, e.g., not wearing hearing protection.
18. AR 611-201, 1 October 1973, Change 14, 1 June 1980 - Provides guidance on enlisted MOS's relative to PULHES (medical fitness codes), e.g., hearing loss.

19. AR 40-501, 5 December 1960, with Changes - Provides medical fitness standards and hearing loss profile action.

20. AR 40-3, 10 October 1977 - Provides medical treatment category and authority for military and DA civilian employees.

21. Federal Employee's Compensation Act (5 U.S.C 8101) - Provides compensation and medical care for civilian employees of all branches of the Government.

22. 38 CFR 4.87a - Establishes ratings of disability for hearing loss for military personnel under the VA system.

23. MIL STD 1474B, 18 June 1979 - Sets the noise limits for Army materiel.

24. MEPCOM 40-1, 31 August 1982 - Provides program requirements for MEPS stations.

25. Noise Control Act of 1972 (PL 92-574), as amended - Establishes Federal noise emission standards and provides information as to noise reduction characteristics of products. Air craft, combat hardware, and rockets are exempt.

26. AR 200-1, 15 June 1982 - Requires major commands to maintain installation compatible noise zones.

LESSON PLAN

INSTRUCTION UNIT: Health Education

TYPE: Lecture

TIME ALLOTTED: 1/2 hour

TOOLS: Sample posters, films shown during workshop, handouts

A. BEHAVIORAL OBJECTIVES.

1. Identify elements required to implement a health education program.
2. Describe obstacles to "selling" hearing conservation.
3. List a variety of health education materials for a hearing conservation program.

B. LECTURE.

1. An effective hearing conservation program depends on each individual's awareness of the effects of noise on hearing and the proper use and care of hearing protective devices.
2. Consider external vs internal pressure to comply with the use of hearing protectors. Command emphasis is important, but each employee must be persuaded to personally recognize risks and take precautions to protect his/her hearing.

3. This is a very difficult program element to implement. Obstacles:

- a. Underestimation of the hazard.
- b. Belief that Noise = Power.
- c. Adaptation.
- d. Misinformation.
- e. National Safety Council's Accident Prevention Formula doesn't work for noise.

(1) See the hazard - Damage due to noise exposure is invisible, likely to be noticed by others first, rather than the affected person.

(2) Understand the defense - Lack of proper training in use of hearing protectors.

(3) Act in time - By the time a person notices hearing problem, loss is already permanent.

4. When to conduct briefings:

- a. At the beginning of work in a noisy area.

b. Annually thereafter - both a formal briefing and an individual informal briefing when the person's audiometric results are evaluated.

5. Types of briefings by hearing conservation program managers/coordinators.

a. Supervisor level.

(1) Emphasize their responsibility to ensure that hearing protection is worn.

(2) Recognize well fitted and properly seated plugs.

(3) Tell them of the referral procedures for employees with hearing problems.

b. Employee level.

(1) Explain the nature of hearing loss.

(2) Describe proper use and care of hearing protectors.

(3) Teach them to recognize noise hazards (3 foot rule).

(4) Tell them to inform supervisor of any hearing problems.

C. HEALTH EDUCATION MATERIALS. See Appendix G, this Handbook.

LESSON PLAN

INSTRUCTIONAL UNIT: The Military Hearing Conservation Team

TYPE: Lecture, Panel Discussion

TIME ALLOTTED: 1 hour

TOOLS, EQUIPMENT AND TRAINING MATERIALS: Chalkboard

A. BEHAVIORAL OBJECTIVES.

1. Discuss immediate and long-term needs for establishing an effective hearing conservation program upon returning to home station.

2. Identify other key individuals on an installation who support missions of the hearing conservation program.

B. TECHNIQUES.

This panel discussion should involve staff members of as many different health and safety personnel as possible. A discussion leader can initiate group discussion by asking questions such as these:

1. When you return to your local hearing conservation program, what critical program elements should you evaluate? (e.g., status of audiometer, biological calibrations, referral criteria, earplugs, forms, regulations and local supplements, health education, etc.)

2. Who will assist you in your local program? (Personnel in occupational health, preventive medicine, audiology, safety, industrial hygiene, medical maintenance, logistics/supply, troop medical clinics, battalion aid stations, physical examination sections; supervisors of those exposed to noise; and ALL SUPERVISORS WHO SET MISSION PRIORITIES FOR THE ABOVE!)

3. What are your greatest handicaps right now which limit your local hearing conservation program's effectiveness? (Open discussion encouraged here.)

4. What are your medical referral criteria? (Found in TB MED 501.)

5. What are the responsibilities of your employees re: hearing conservation? (e.g., Wear hearing protection as required, report for hearing tests, etc.).

6. What should you request from your supervisor which could enhance your program's effectiveness? (e.g., Time, personnel support, equipment, command support, etc.)

LESSON PLAN

INSTRUCTIONAL UNIT: Personal Experience With Hearing Loss

TYPE: Lecture (by a hearing aid wearer who is a senior military noncommissioned or commissioned officer with a long-standing hearing loss caused by noise exposure prior to adequate hearing conservation emphasis).

TIME ALLOTTED: 15-30 minutes

TOOLS, EQUIPMENT AND TRAINING MATERIALS: None

A. OBJECTIVES. No student behavioral objectives exist for this lecture. The presentation is intended to expose students to a hearing-impaired soldier with an actual history of inadequate use of hearing protection; which resulted in a hearing loss and subsequent career, social and personal communication disadvantages. Such exposure will make real the effects of hearing loss discussed in class and highlight the importance of the role of a strong hearing conservation program.

B. LECTURE OUTLINE.

1. The discussion of details will vary from speaker to speaker, but should address:

a. "My first exposure to hazardous noise levels was..."

b. "In my career, I was exposed to the following noises in my military duty..."

c. "In these early noise experiences, the only hearing protection I had available to me was..."

d. "The first time any medical professional said anything to me about my hearing ability was..."

e. "The first time I noticed problems in hearing was..."

f. "As my hearing got worse, I found my problems to become greater, especially when listening to..."

g. "The most frustrating thing about my present hearing ability is..."

h. "I now wear a hearing aid. It helps, but it's not restoring my hearing to "perfect" because..."

i. "I finally noticed emphasis on hearing protection in the Army (when)..."

j. "Whenever I get a chance to influence anyone who doesn't consider hearing protection important, I say..."

2. The speaker should not dwell upon the function or use of hearing aids, since the workshop is for discussion of hearing conservation, not hearing rehabilitation. When seeking a potential speaker, find an outgoing individual who is known to be aware and supportive of the hearing conservation program.

LESSON PLAN

INSTRUCTIONAL UNIT: Role Playing - Application of Hearing Conservation

Principles: REVIEW

TYPE: Student-participation, faculty-directed

TIME ALLOTTED: 1 hour, after final examination

TOOLS, EQUIPMENT AND TRAINING MATERIALS: (props may vary with scenarios used, see Appendix H, this handbook, for props for specific scenarios)

A. BEHAVIORAL OBJECTIVES.

1. Apply hearing conservation principles, learned in class, to a variety of common scenarios which student may confront.

2. Recognize closure of course's idyllic classroom environment to real-life problem solving.

3. Observe other students' problem-solving methods and make corrections or suggestions, as necessary.

B. JUSTIFICATION.

1. Students have completed their final examination before this review and role-playing exercise. At this time, they must begin to think of successful techniques to apply the lecture and reading recommendations to their local program, as they return to duty. Past experience with this

type of exercise has proven it to be a highly motivating teaching tool. Students can observe scenarios of common hearing conservation problems and seek solutions in an environment which is non-threatening re: their career or scrutiny of their supervisors. It is important for the staff to encourage humor and spontaneity within the exercise to motivate maximum student participation (including self-conscious and underconfident students). Props are important for student involvement, although such props need not be complicated or exclusively for this exercise.

2. In summary, students need an opportunity for transition from the classroom to worksite. Workshop faculty members need a tool to evaluate the students' comprehension and ability to apply regulatory requirements and hearing conservation principles. Through the use of a final review such as this role playing exercise, both groups can successfully close out the workshop with an appreciation of the net worth of the training.

C. TECHNIQUE.

1. The faculty member in charge should describe the objectives and justification for this exercise and encourage students to enjoy themselves in their roles (since the written examination and its related stress is now past). A random drawing for the order of participants is made, i.e., names can be drawn from a hat to determine the next student to solve the scenario. Since the mood of the whole exercise is subject to the motivation and uniqueness of the first scenario seen, it is best to "select" the first student from your most extroverted students and to use a scenario with great potential for a unique solution.

2. The students should come forward and the faculty member should describe the "situation". Then both students and faculty should become fully involved in their roles until the faculty member recognizes the student's solution or senses no progress. After stopping the scenario, the faculty member should review the situation and the solution, occasionally seeking other solutions from the remainder of the class. Each scenario should be no more than 5 minutes from introduction to summary, to keep the exercise lively and spontaneous.

3. Appendix H contains a variety of suggested scenarios, which can be modified or be replaced by local workshop faculty members. Since each scenario should be realistic (as well as enjoyable), other scenarios, from the experience of local audiologists or other faculty members, might be better suited for use.

AUDIOMETRIC PRACTICUM EXAMINATION

TIME ALLOTTED: 10 minutes per student, per instructor

TOOLS, EQUIPMENT, AND MATERIALS:

1. Audiometers - Should be of same general type and manufacturer as majority of students in class will use at their home station. They should have been easily available for use and emphasized during Audiometric Practicum. Audiometers should be generally similar at all testing stations used during this practicum exam. They should be functioning, with appropriate calibration confirmed.

2. Seating and privacy for exam. Find a quiet room, with visual isolation from distracting activity.

3. Waiting area for next student should be adjacent to examination area.

4. Rosters of the students attending should be available for use by instructors. After the examinations, their lists should be consolidated to note any students who failed or have not yet taken practicum examination.

A. BEHAVIORAL OBJECTIVES.

1. Demonstrate a proficiency in using audiometer to obtain thresholds.

2. Without notes, verbally provide standard audiometric instructions, as present in class.

3. Demonstrate a proficiency in conducting standard daily listening checks on an audiometer.

B. DISCUSSION.

1. Students should demonstrate their proficiency in audiometry using audiometers which are in use by the majority of the stations represented (preferably manual audiometers). An adequate number of instructors should be available to man enough testing stations to accommodate one student per 10 minutes of time allotted during the practicum exam. NOTE: Students should be well prepared for the exam before allowed to take it. Provide adequate practicum time during the workshop to those students with doubtful proficiencies.

2. Set up the testing stations relatively near the classroom. Take one student at a time into each testing station with a second waiting in an adjacent area.

3. Provide the following instructions:

"You will be serving as the examiner for one patient (me). Using this audiometer, you must first establish that the equipment is functioning properly through a function check. Once you have completed (or

described) the function check of the audiometer, you must instruct the patient so that there is no question as to what you expect during the test. Next you must perform the hearing test. Treat me as an actual patient. I will, however, ask to see the audiometer dial during your testing in order to observe your technique. Do you have any questions?"

4. A description of the function checks will be satisfactory in order to save time. (Students tend to be very deliberate and slow during their exam and need prompting, in order to spend a more appropriate amount of time on the procedures.) The student should describe (or demonstrate) an ability to:

- a. Detect a minor fault in the set-up of the audiometer and describe or demonstrate how it should be corrected.
- b. Perform a headset check. Observe condition of cushions, tension, look for signs of wear and tear.
- c. Perform an earphone cord check. Correct connections, listen for interruption of tone while bending cord at earphone and phone jack connections.
- d. Check the interrupter switch and check for signal distortion.
- e. Perform a cross-talk check. Disconnect right earphone jack and present tone through the right earphone. Listen for tone in left earphone.

f. Check frequency dial. Check frequencies 500 through 6000 Hz for each earphone.

g. Check attenuator dial. Sweep attenuator 0 to 60 dB HTL; check both earphones.

5. The student should then proceed to give instructions and position the earphones. Next, the student should demonstrate a proper technique in obtaining thresholds, using the audiometer provided. The instructor should use a controlled "coaching technique" described on page 5-78, this handbook. After two or three frequencies have been properly tested, the instructor may cease the exam and report on the student's performance. If the student cannot satisfactorily meet the established criteria for passing, the instructor should describe the problems and recommend that the student return to the classroom and practice, with a later retest. In the retest, a different instructor should be used and the same criteria followed. IN ALL CASES, ALL INSTRUCTORS SHOULD BE BRIEFED ON THE PERFORMANCE STANDARDS EXPECTED AND THE AVERAGE TIME TO BE ALLOTTED PER STUDENT. THIS STANDARDIZATION IS ESSENTIAL TO AVERT DISCREPANCIES AMONG STUDENT APPRAISALS.

CHAPTER 6

STUDENT MATERIALS

WRITTEN EXAMINATION

TIME ALLOTTED: 1 Hour

TOOLS, EQUIPMENT AND MATERIALS: Adequate number of examinations for all students, quiet and comfortable area for writing exam, key sheet, and answer sheets. A fast way to grade exams is to punch out correct answers on a key answer sheet and lay it over student answer sheets.

DISCUSSION. Students should be urged to take their time and think through all responses. Many will become anxious due to their unfamiliar role as a student. When grading, keep an item analysis for use in modifying exam for next workshop. Establish and announce your criteria for passing. No less than 70 percent should be accepted as a passing exam.

CAOMC Recommended Format for

Written Exam

20 percent of Exam should be questions regarding:

- 1. Legal Aspects*
- 2. Physiology and Anatomy*
- 3. General Overview*
- 4. Noise Analysis*

80 percent of Exam should be questions regarding:

- 1. Test Technique*
- 2. Personal Hearing Protection*
- 3. Role of Conservationist*
- 4. Audiograms*
- 5. Audiometer*
- 6. Recordkeeping*

NOTE: The use of daily student worksheets (homework) provides a valuable feedback to the faculty and student. On the following pages are sample daily worksheets. Point totals indicated in the left margin are related to the value of the question. A sample workshop critique, for use by students after they have written the final examination, is provided as Figure 3 (pages 6-13 and 6-14).

SAMPLE DAILY WORKSHEET

DAY #1

INSTRUCTIONS. This worksheet is to be completed using your notes from today's presentations. Write your answer in the space provided, being as complete as possible. This will be collected tomorrow morning and returned to you. This worksheet is applicable to your final point total for certification (point values are listed next to each question below).

POINTS

- (7) 1. Describe the pathway of sound energy as it travels from air waves outside the skull, through the human hearing mechanism, to the acoustic nerve. List at least seven parts of anatomy, in proper sequence.

POINTS

- (2) 2. Listed below are terms which are subjective (psychological) aspects of sound. Next to each term, write its corresponding objective (physiological) term and the unit of measurement.

Objective (physiological) aspect		Unit of measurement
a. Loudness:		
b. Pitch:		

- (2) 3. Why are noise-related hearing losses usually considered permanent and not medically treatable, while hearing losses related to middle ear infections can be improved with medical attention?

- (4) 4. Listed below are common "alibis" used by workers in noise-hazardous areas. After each "alibi", write a reasonable response which a hearing conservationist could use to show the weakness of such a reason to that worker.

I DON'T WEAR HEARING PROTECTION BECAUSE..."

- a. "...I can't hear people warn me about something dangerous when I wear earplugs."
- b. "...I lose those little earplugs and it takes too long to put them in my ears when I'm cutting lumber."
- c. "...my ears hurt when I wear earplugs."
- d. "...I've already lost my hearing - years ago."

SAMPLE DAILY WORKSHEET

DAY #2

INSTRUCTIONS. This worksheet is to be completed using your notes from today's presentations. Write your answer in the space provided, being as complete as possible. This will be collected tomorrow morning and returned to you. This worksheet is applicable to your final point total for certification (point values are listed next to each question below).

POINTS

- (2) 1. Describe the typical, progressive audiometric pattern of hearing loss which can occur over a period of years with excessive noise exposure.

POINTS

- (5) 2. Write the standard audiometric instructions you would use prior to a hearing test. Be sure to include all instructions recommended in today's class. (Your equipment: manual audiometer).

- (2) 3. You have just conducted your first biological calibration and obtained the results listed below (83 May 18). What are your actions now?

NAME (Last, first, MI) Holloway, Clarence		SSN 111 33 88 88		FACILITY USAHC, APG-EA,		LOCATION APG-EA, MD									
DATES AND DATA REVIEW		CALIB CHECK		HEARING THRESHOLD LEVELS OF TEST FREQUENCIES RE: ANSI S3.6											
DATE (year, month, day)	NAME OF EXAMINER (Last, first, MI)	PASS: + 5dB OF BASELINE	FAIL: greater than + 10dB OF BASELINE	LEFT EARPHONE				RIGHT EARPHONE							
				500	1000	2000	3000	4000	6000	500	1000	2000	3000	4000	6000
				BASELINE											
83 May 10	Lynch, Fred			5	10	10	15	30	10	5	10	10	10	20	20
PERIODIC BIOLOGICAL CALIBRATION CHECKS															
83 May 18	Mueller, Parnelli			5	10	15	10	30	15	15	15	15	15	20	20

POINTS

- (5) 4. Listed are five daily prechecks conducted on a manual audiometer. What abnormality is possible in each check and how could that abnormality affect audiometric testing?

a. Listening check, cords:

b. Check of interrupter switch and signal distortion:

c. Cross-talk check:

d. Intensity check:

e. Frequency check:

- (1) 5. How is a Type 1 sound level meter different from a Type 2 sound level meter?

SAMPLE DAILY WORKSHEET

DAY #3

INSTRUCTIONS. This worksheet is to be completed using your notes from today's presentations. Write your answer in the space provided, being as complete as possible. This will be collected tomorrow morning and returned to you. This worksheet is applicable to your final point total for certification (point values are listed next to each question below).

POINTS

- (1) 1. What is the likely effect of excessive background noise (i.e., a noisy fan in the booth) upon the audiometric test results?

- (2) 2. What is the difference between cross-talk and crossover?

POINTS

- (2) 3. What is the difference between dBA and dBHTL?

- (3) 4. After a noise survey has identified that a new rock-crushing operation exposes the workers there to 109 dBA, what actions are taken, regarding:
 - a. Danger signs:

 - b. Hearing protection:

 - c. Engineering controls:

- (1) 5. What advantage does the use of a pulse-tone presentation have over a steady-tone presentation?

POINTS

- (1) 6. The OSHA regulation requires that the make, model, and serial number of the audiometer be included in the audiogram. Why is this required?

- (2) 7. Describe the HEARS system, used in the Army Hearing Conservation Program.

- (1) 8. Why should eyeglasses be removed prior to audiometric testing?

- (1) 9. Why should the audiometric technician stress, in the instructions, the importance of responding no matter how faint the tone appears?

POINTS

- (1) 10. Why is the baseline audiometric test important to the hearing conservation program?

WORKSHOP CRITIQUE

The following questions have been designed to help us improve future courses. Your thoughtful consideration to each question will be most appreciated.

1. Objective communicated and accomplished
Yes _____ Partially _____ No _____
2. Coverage of subject matter
Excellent _____ Sufficient _____ Poor _____
3. Organization of subject matter
Well organized _____ Adequate _____ Poorly organized _____
4. Suitability of instructional materials
Excellent _____ Adequate _____ Poor _____
5. Level of difficulty
Too advanced _____ Appropriate _____ Too elementary _____
6. Length of course
Too long _____ Appropriate _____ Too short _____
7. Amount of evening or outside work
Too much _____ Appropriate _____ Insufficient _____
8. Effectiveness of instructors
Excellent _____ Good _____ Poor _____
9. Applicability of subject matter to the job
Significant _____ Adequate _____ Insignificant _____
10. Facilities
Excellent _____ Good _____ Poor _____
11. Recommendation to colleagues
Highly recommend _____ Recommend _____ Not Recommended _____

FIGURE 3. SAMPLE WORKSHOP CRITIQUE

12. Meet career development plans

Yes _____

No _____

Not applicable _____

13. What is your overall rating of the course? Please explain and cite specific areas and/or instructors which you found boring/uninteresting/unprepared or exceptional/noteworthy.

14. In which areas could the course be improved?

15. What alternate/additional subjects would you suggest?

16. Additional comments:

THANK YOU FOR ATTENDING

Department of the Army

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY

BIO-ACOUSTICS DIVISION

This certifies **Pat**

has satisfactorily completed training as an

ARMY HEARING CONSERVATIONIST

This training was performed by accredited instructors and meets the requirements of the Council for Accreditation in Occupational Hearing Conservation and qualifies the holder to petition the Council for certification if hearing conservation services are to be performed in a nonmilitary capacity.

S **CERTIFIED INSTRUCTOR** _____

CERTIFICATION NO. _____

COURSE DIRECTOR _____

DATE _____

AEHA Form 183, 1 Nov 82 (HSHB-OB)
Replaces HSHB-OB Form 93, 1 Jun 80, which will be used.

FIGURE 4. SAMPLE TRAINING CERTIFICATE

CHAPTER 7

ADMINISTRATIVE PLANNING GUIDE

AFTER-ACTION PLANNING GUIDE

<u>ACTION</u>	<u>CONSIDERATIONS</u>
1. REVIEW CRITIQUES, RECORD RECOMMENDATIONS.	1. Revise agenda, handouts, examination questions as soon as possible.
2. MAINTAIN FILE RECORDS OF ALL ACTIONS.	2. Make available for planning future workshops.
3. SEND FOLLOW-UP LETTERS TO CAOHC, OTHER ACCREDITING ORGANIZATIONS.	3. Summarize course content. Provide final agenda and list of graduates, with certification numbers.
4. SEND NOTIFICATION LETTERS TO SPECIAL INDIVIDUALS.	4. Notify supervisors of honor graduate and any participant(s) not meeting course standards. Notify your management of workshop outcome.

5. PROVIDE FOLLOW-UP TO STUDENTS AND/OR THEIR SUPERVISORS (NEXT PAGE).

5. Stress your availability for questions and help when students return home. Contact students or supervisor 4-6 weeks after workshop. A sample post-workshop follow-up letter is provided as Figure 5. Provide a checklist for them to check their progress and offer support.

6. PROVIDE LIST OF GRADUATES AND REQUEST THEIR CERTIFICATION NUMBERS FROM USAEHA (OTHER SERVICES).

6. USAEHA maintains roster of all certification numbers from Army hearing conservation courses. If Navy or Air Force personnel participated, send their names to their hearing conservation agency:

Navy:

Commander
Navy Environmental Health Center
ATTN: Hearing Conservation Function
Naval Station
Norfolk, VA 23511

Air Force:

USAF School of Aerospace Medicine
OEHL/ECO
Brooks AFB, TX 78235

7. WRITE LETTERS OF APPRECIATION TO WORTHY WORKSHOP PARTICIPANTS (THOSE WHO PROVIDED SERVICES OR ASSISTANCE).

7. Prepare for signature by a senior officer in your command. Include a request that letter be included in individual's personnel file.

HSHB-OB

SUBJECT: **Hearing** Conservation Workshop, 30 day Follow-up Letter

Commander
(unit of workshop graduate)

1. An accredited Hearing Conservation Workshop was held at (location and date). Among those successfully completing the course was a member of your command:

2. This individual was presented hours of classroom instruction, problem-solving exercises, and hands-on experience in the elements of hearing conservation programs. As this individual returns to duty in your unit, his/her duties in the following areas will require your support:

a. Establishing overall conduct of the local program per AR 40-5 and TB MED 501.

b. Serving as point of contact in hearing conservation for units served in your community.

c. Performing audiometry with proper technique.

d. Ensuring that proper referral criteria are considered.

e. Using proper forms for reference and periodic audiograms.

f. Providing health education in the risks of high noise exposure to hearing.

g. Recommending, fitting and issuing hearing protection appropriately.

3. Full utilization of this individual within your hearing conservation program staff can significantly improve your unit's readiness by conserving hearing ability required for communication and auditory signals in duty. Please forward this correspondence to the individual's direct supervisor, with recommendations that he/she continue to work in hearing conservation. Should any other individuals in your unit require similar training, it can be requested through this headquarters.

FIGURE 5. POST-WORKSHOP FOLLOW-UP LETTER

CHAPTER 8

BIBLIOGRAPHY AND REFERENCE MATERIALS

YOUR PRIMARY REFERENCE SHOULD BE TB MED 501, Hearing Conservation. These materials can provide background material for workshop faculty.

A. MILITARY REFERENCES.

1. AR 40-3, Medical, Dental, and Veterinary Care, 10 October 1977.
2. AR 40-5, Health and Environment, 25 September 1974.
3. AR 40-501, Standards of Medical Fitness, 5 December 1960, with changes.
4. AR 200-1, Environmental Protection and Enhancement, 15 June 1982.
5. AR 385-10, Army Safety Program, 1 February 1979.
6. AR 385-30, Safety Color Code Markings and Signs, 15 September 1983.
7. AR 385-32, Protective Clothing and Equipment, 1 May 1982.
8. AR 385-40, Accident Reporting and Records, 1 September 1980.
9. AR 385-63, Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat, 22 February 1978.
10. AR 420-70, Buildings and Structures, 17 November 1976.
11. AR 611-201, Enlisted Career Management Fields and Military Occupational Specialties, 1 October 1973, with Change 14, 1 June 1980.
12. TB MED 501, Occupational and Environmental Health: Hearing Conservation, 15 March 1980.
13. TB 746-93-2, Painting and Marking of Army Aircraft, 10 August 1978.
14. TB 750-8-1, Maintenance Expenditure Limits for Medical Equipment, 15 August 1981.
15. TM 8-605, Preventive Maintenance Procedures and Serviceability Standards for Medical Equipment, 31 May 1977.
16. Public Law 92-574, Noise Control Act of 1972, 27 October 1972.
17. Title 38, Code of Federal Regulations, Section 4.87, Determination of Auditory Acuity.
18. Title 29, Code of Federal Regulations, Section 1910.95, Occupational Hearing Conservation.

19. Federal Employee Compensation Act, 5 U.S.C. 8101.
20. CPR, M1 (Change 3), Medical Examination, 15 September 1963.
21. CPR 700 (Change 14), 751.A, Tables Pertaining to Penalties for Various Offenses, 12 March 1973.
22. MIL STD-1474B (M1), Noise Limits for Army Materiel, 18 June 1979.
23. Uniform Code of Military Justice, Manual for Courts-Martial, United States, revised 1969.
24. MEPCOM 40-1, Medical Processing and Examination Policies - Military Entrance Processing Stations, 1 August 1982, with Changes.
25. USAEHA Technical Guide (Med) 040, Noise Hazard Evaluation-Sound Level Data of Noise Sources, January 1975.
26. USAEHA Technical Guide (Med) 041, Personal Hearing Protective Devices-Fitting, Care and Use, October 1975.

B. STANDARDS, REGULATIONS AND REFERENCE MATERIALS.

1. American National Standards Institute. Preferred Frequencies and Band Number for Acoustical Measurements. S1.6-1967 (R1976).
2. American National Standards Institute. Specifications for Audiometers. S3.6-1969 (R1973).
3. American National Standards Institute. Specifications for Sound Level Meters. S1.4-1971 (R1976).
4. Council for Accreditation in Occupational Hearing Conservation. Conservationists' Manual. Haddon Heights, New Jersey, 1978.
5. Harris, C.M. (ed). Handbook of Noise Control, Second Edition. McGraw-Hill, New York, 1979.
6. Industrial Noise Manual, Third Edition. American Industrial Hygiene Association, Akron, Ohio, 1975.
7. Lipscomb, D.M. (ed). Noise and Audiology. University Park Press, Baltimore, 1978.
8. Melnick, W. Industrial Hearing Conservation. In Handbook of Clinical Audiology, Second Edition, J. Katz (ed). Williams and Wilkins Company, Baltimore, 1978.
9. Miller, M.H. Occupational Hearing Conservation: State of the Art. Monographs in Contemporary Audiology. Vol. 3, No. 1, 1981.

10. Noise and Hearing Conservation. American Industrial Hygiene Association Monograph Series. Akron, Ohio, June, 1981.

11. Noise as a Public Health Problem. American Speech-Language-Hearing Association. Report No. 10, April, 1980.

12. Sataloff, J., Sataloff, R.T. and Vassallo, L.A. Hearing Loss. (2nd ed.). Lippincott and Company, Philadelphia, PA, 1980.

13. US Department of Labor. Occupational Noise Exposure, Rules and Regulations. Federal Register 48, No. 46, March 8, 1983, pp 9776.

C. PROFESSIONAL JOURNALS.

1. Ear and Hearing. Journal of the American Auditory Society. Williams and Wilkins Company, 428 East Preston Street, Baltimore, MD 21202.

2. Journal of the Acoustical Society of America. Acoustical Society of America, 335 East 45th Street, New York, NY 10017.

3. Journal of Occupational Medicine. American Occupational Medicine Association, 150 North Wacker Drive, Chicago, IL 60606.

4. Journal of Speech and Hearing Research. Journal of the American Speech-Language-Hearing Association, 10801 Rockville Pike, Rockville, MD 20852.

5. Journal of Sound and Vibration. Academic Press, Inc., 111 Fifth Avenue, New York, NY 10003 (Official Publication of the British Acoustical Society).

6. Sound and Vibration. Acoustical Publications, Inc., 27101 East Oviatt Road, Bay Village, OH 44140.

APPENDIX A

ABBREVIATIONS

AMEDD	Army Medical Department
ANSI	American National Standards Institute
APG	Aberdeen Proving Ground
AR	Army Regulation
AV	Audio-visual
BAD	Bio-Acoustics Division
CAOHC	Council for Accreditation in Occupational Hearing Conservation
CD	Course Director
CONUS	Continental United States
DA	Department of the Army
dB	decibel
dBA	decibels, measured on the "A" scale
dBp	decibels, peak sound pressure level
DD/DOD	Department of Defense
ENT	Ear, Nose and Throat
HEARS	Hearing Evaluation Automated Registry System
HL	Hearing Level
HTL	Hearing Threshold Levels
Hz	hertz
kHz	kilo hertz
LCD	Liquid Crystal Display
LED	Light Emitting Dioxide
m	meter
μ	micro
MEDDAC	US Army Medical Department Activity
MEPS	Military Entrance Processing Station
MOS	Military Occupational Specialty
N	Newton
NIOSH	National Institute for Occupational Safety and Health
NSN	National Stock Number
OHC	Occupational Hearing Conservationists
OHN	Occupational Health Nurse
Pa	Pascals
SF	Standard Form
SLM	Sound Level Meter
SPL	Sound Pressure Level
SSI	Specialty Skill Identifier
SSN	Social Security Number
STS	Significant Threshold Shift
TG	Technical Guide
USAEHA	US Army Environmental Hygiene Agency
USAHC	US Army Health Clinic
USAMMA	US Army Medical Material Agency

APPENDIX B

COUNCIL FOR ACCREDITATION IN OCCUPATIONAL HEARING CONSERVATION
HISTORY

During the late 1950's, there was a growing awareness of the effects of noise on the industrial population. Early in the 1960's, an organization of occupational health nurses requested permission to run courses for DHN's to do audiometric screening in their respective industries.

In 1967, the INTERSOCIETY Committee published its first report, "Guidelines for Noise Exposure Control." They proposed the A-weighted sound level measure and presented data on risk of impairment.

In December 1972, the INTERSOCIETY adopted a new name-The American Board of Occupational Hearing Conservation Technicians. The objective of the Board was to "set standards and establish training policies and methods for providing industry with technicians who will be able to conduct quality hearing conservation programs in large and small industries." It was also established that the Board could not limit its training and certification programs to persons representing specific disciplines nor could it discriminate on the basis of race or creed.

In a February 28, 1973 meeting, the name was changed to Council of Accreditation in Occupational Hearing Conservation (CAOHC).

The organizations that are represented on the Council of Accreditation in Occupational Hearing Conservation (CAOHC) Board are:

ASHA - American Speech-Language-Hearing Association (formerly the American Speech and Hearing Association) - professionals in Audiology and related fields.

AIHA - American Industrial Hygiene Association - professionals in Industrial Hygiene and its many facets.

AAO/HNS - American Academy of Otolaryngology - Head and Neck Surgery - professionals and Medical Specialists in the field.

AAOHN - American Association of Occupational Health Nurses - professional registered nurses in the occupational health field.

AAOM - American Academy of Occupational Medicine - physician members of American Medical Association in occupational health fields.

AOMA - American Occupational Medical Association - physicians in the occupational health field.

NSC - National Safety Council - Safety professionals in the occupational health field.

CAOHC maintains its office at 1619 Chestnut Ave., Haddon Hts., NJ 08035, phone (609) 547-6243.

APPENDIX C
CAOHC CERTIFICATION REQUIREMENTS

1. The Council for Accreditation in Occupational Hearing Conservation (CAOHC) accredits individuals on two levels:

- a. The course director.
- b. The occupational hearing conservationist.

2. Specific requirements in each category which must be met for CAOHC approval are:

a. Course Director Requirements:

- (1) Demonstration of an adequate educational background.

The educational requirement may be fulfilled by individuals who currently hold or are eligible for certification by one of the Certifying Boards who represent the professional organizations on the council, (the American Academy of Occupational Medicine, the American Association of Occupational Health Nurses, the American Academy of Otolaryngology - Head and Neck Surgery, the American Industrial Hygiene Association, the American Occupational Medical Association, the American Speech-Language-Hearing Association).

(2) Participation in occupational hearing conservation programs or participate as a faculty member in previous training programs.

The experience requirement may be satisfied by individuals who provide evidence of full-time employment in an occupational hearing conservation program for a period of 1 year or part-time service as a consultant to industry in an area related to hearing conservation for 3 years. This requirement may also be fulfilled by those individuals who have served as a faculty member in programs for training occupational hearing conservationists (audiometric technicians) which follow the guidelines approved by the Council. In this case, the applicant should have served as faculty in four separate training sessions prior to submitting application for approval as a course director.

(3) Completion of an application form including required fees.

(4) Attendance and completion of an 8-hour CAOHC initial certification program (or a course equivalent to and receiving prior approval from CAOHC) prior to acceptance.

(5) The application must be reviewed for compliance and approval by CAOHC. The Course Director is the individual responsible for planning and conducting training courses for OHC's. The Director is responsible for ensuring that specific CAOHC course guidelines are carefully followed and for determining the qualifications and competence of individual faculty members participating in the training courses.

NOTE:

1. CAOHC has continually revised their requirements and course directors are encouraged to verify these printed requirements with the CAOHC Executive Secretary and BAD, USAEHA.
2. Military Officers applying for certification as course directors by the Council for Accreditation in Occupational Hearing Conservation (CAOHC) should note that CAOHC calls for an experience requirement of "full-time service as a consultant to industry in an area related to hearing conservation for 3 years." More than one audiologist has contacted BAD, USAEHA, and reported difficulty in obtaining certification after writing "50 percent of my time is spent in hearing conservation" on the CAOHC application. CAOHC has disputed such applications if less than 3 years has been spent in that duty. Consider this potential problem when completing your application. If you have responsibility as a full-time hearing conservation officer, list this in a way which will be judged as full-time duty, where applicable. In summary, avoid using any descriptors which are less than 100 percent.

b. Occupational Hearing Conservationist Requirements.

(1) Successful completion of a minimum 20 hour course following the course outline developed by CAOHC which includes practical and written examinations.

(2) Submission to CAOHC of application and related materials including required fees.

3. The Occupational Hearing Conservationist is qualified to perform the following services:

a. Pure-tone-air-conduction baseline and follow-up hearing tests on employees in industry.

b. Other closely associated responsibilities with other members of the occupational hearing conservation team.

4. Recertification of Course Directors is required within 5 years of the original certification. This requirement can be met by completion of an 8 hour CAOHC sponsored workshop or an equivalent course reviewed and approved by CAOHC, or by offering one CAOHC approved workshop per year for a 5 year period.

APPENDIX D

POLICY STATEMENT ON RECERTIFICATION OF AUDIOMETRIC TECHNICIANS,
COUNCIL FOR ACCREDITATION IN OCCUPATIONAL HEARING CONSERVATION*

* * * * *

We have been notifying CAOHC/OHC's regarding their delinquent recertifications. CAOHC certification is good for a 5 year period. If your certification has reached 5 years, you must take an 8 hour CAOHC Refresher Course...

If your CAOHC certification ran out more than a year (ago) -- you must take a whole new 20 hour CAOHC course under a certified Course Director...

If your original training was prior to '73 or from a non-CAOHC source, contact a CAOHC Certified Course Director for a full 20 hour course.

* * * * *

Personnel conducting audiometric testing in support of US Army Hearing Conservation Programs need not be certified by CAOHC, but must have received at least equivalent military training (paragraph 9e, TB MED 501). In light of the criteria given above, personnel with equivalent military training should receive at least 8 hours of refresher training before the fifth anniversary of their original training. A grace period of 1 year is available, but if more than 6 years has elapsed, a full 20 hours of training must be provided.

* Extracted from "Update" Issue No. 11, Council for Accreditation in Occupational Hearing Conservation, Cherry Hill, New Jersey, Fall 1982.

APPENDIX E
COUNCIL FOR ACCREDITATION IN
OCCUPATIONAL HEARING CONSERVATION
COURSE OUTLINE

(LEADING TO ACCREDITATION AS AN OCCUPATIONAL HEARING CONSERVATIONIST)

1. Summary.

a. The Training Program shall equip the Occupational Hearing Conservationist with background knowledge and understanding of the following:

- (1) His/her responsibilities and limitations as an Occupational Hearing Conservationist.
 - (2) The responsibilities of the other members of the Hearing Conservation Program.
 - (3) The parameters of sound as they relate to hearing conservation.
 - (4) Basic anatomy and physiology as they relate to hearing testing.
 - (5) The concept of compensable hearing loss and state compensation legislation.
 - (6) The concept of Federal and State legislation.
 - (7) Types of audiometric instrumentation.
 - (8) Performance check and calibration of audiometric instrumentation.
- (a) Biological.
 - (b) Electroacoustic (in concept).

- (9) Care of instrumentation.
- (10) Pure tone threshold testing techniques.
- (11) Basics of recordkeeping.
- (12) Personal hearing protective devices.
 - (a) Selection.
 - (b) Fitting.
 - (c) Monitoring.
- (13) Employee hearing conservation education.
- (14) The concept and principles of noise measurement and control.
- (15) Types and causes of hearing loss.
- (16) The principles of developing and implementing a referral system.

b. The course is not intended to prepare the Occupational Hearing Conservationist to be:

- (1) An instructor of other conservationists.
- (2) An audiologist.
- (3) A program manager.
- (4) An acoustical engineer.

c. This course in Occupational Hearing Conservation does not qualify an individual to perform (unless otherwise qualified).

- (1) Interpretation of audiograms.
- (2) Responsibility for noise analysis.

- (3) Diagnosing hearing problems.
- (4) Administration of the Hearing Conservation Program.
- (5) Responsibility for noise control problems.

d. Specific Requirements of the Course.

(1) Director of the course must be accredited by the Council for Accreditation in Occupational Hearing Conservation.

(2) There should be a ratio of at least one practicum instructor for each six registrants.

(3) The ratio of audiometers to students for practicum should not exceed 1 to 3.

(4) Course instructors should represent a variety of professional disciplines such as: medicine, industrial hygiene, safety, nursing, audiology, etc. Minimum number of disciplines which must be represented is 3.

(5) The following topics shall be covered. The time allocations are minimum times with the remainder up to a minimum of 20 hours to be allocated among those other areas at the discretion of the course director. As it is possible that some students will not qualify for certification, it is recommended that awarding of certificates not be included in the 20 hour curriculum.

2. Course Outline, Lectures and Topics.

a. Topic: *Hearing Conservation in Noise* (60 min)

- (1) Overview of Occupational Noise as a Problem
- (2) Effects of Noise on People
- (3) Social, Economic and Legal Ramifications
- (4) Objectives of Training Program
 - (a) Valid Baseline and Monitoring Audiograms
 - (b) Effective Hearing Protection Program
 - (c) Identification and Referral
 - (d) Employee Education Program
 - (e) Other Areas
 - (f) Responsibilities and Limitations of Occupational Hearing

Conservationists (OHC)

b. Topic: *Anatomy and Physiology and Disease of the Human Ear* (60 min)

- (1) Structure and Function - Lecture
- (2) Visual Screening Inspection of the Ear - What to Look For
- (3) Causes and Types of Hearing Loss

c. Topic: *Sound, Psychophysics and Audition* (60 min)

Parameters of Sound and Definitions

- (1) Pure and Complex Signals
- (2) Frequency
- (3) The Decibel
- (4) Audiometric Standards
- (5) Other Definitions - HL vs SPL, etc.

*d. Topic: *Federal and State Regulations Relating to Noise and Hearing Loss* (60 min)

- (1) Federal Legislation
- (2) State and Local Legislation
- (3) Compensation

e. Topic: *The Audiometer* (90 min)

- (1) Description and Demonstration of Instruments
- (2) Operation of the Audiometer
- (3) Audiometer Performance Check
- (4) Methods of Calibration
- (5) Review of Terminology

* Required for refresher workshops.

*f. Topic: *Audiometric Technique* (60 min)

- (1) Instructions to Subject
- (2) Test Procedure-Demonstration
- (3) Special Situations
- (4) Recording of Audiograms
- (5) Testing Environment

*g. Topic: *The Audiogram* (30 min)

h. Topic: *Review - Questions and Answers* (60 min)

*i. Topic: *Supervised Audiometric Testing* (150 min)

- (1) Self Recording Audiometer
- (2) Manual Audiometer
- (3) Other Types of Audiometers
- (4) Testing Persons with Normal Hearing and Those with Hearing Loss
- (5) Audiometer-Simulator (Optional)

j. Topic: *Review of Audiometric Techniques* (60 min)

Additional Practicum

* Required for refresher workshops.

k. Topic: *Principles of Noise Analysis* (60 min)

- (1) Description of Instrumentation
- (2) Procedures and Demonstration of Noise Measurement

*l. Topic: *The Occupational Hearing Conservationist in the Industrial Setting* (60 min)

- (1) Responsibility of Employee
- (2) Role in Plant Education Program
- (3) Role in Overall Hearing Conservation Program
- (4) Referral Criteria

m. Topic: *Personal Hearing Protective Devices* (60 min)

- (1) Attenuation Characteristics of Hearing Protection
- (2) Ear Muffs, Plugs
- (3) Fitting and Counseling Procedures
- (4) Practicum

*n. Topic: *Recordkeeping* (60 min)

- (1) History
- (2) Audiograms
- (3) Calibrations

* Required for refresher workshops

*o. Topic: *Review of Hearing Conservation Program* (60 min)

- (1) Summary of Total Program
- (2) Question and Answer Period

*p. Topic: *Examination* (60 min)

Practicum and Written

3. An outline of the course and dates must be submitted for approval at least 30 days prior to scheduled date. The CAOHC office will check the course content and time allotments along with the disciplines involved and send back a "CAOHC approval" notice to post at the course and permission to advertise CAOHC approved. If the course is conducted without this measure, the students will NOT be eligible for certification by CAOHC.

4. It is strongly suggested that you review the Course Outline to assure that you are meeting the requirements. There are specific topics with time allotments which must be presented by a minimum of three disciplines. The Course Director should be present to oversee presentations and laboratory practicum.

5. CAOHC has continually modified their requirements and all course directors are encouraged to verify these printed requirements with BAD, USAEHA and the CAOHC Executive Secretary.

* Required for refresher workshops.

6. Guidelines for CAOHC Approved Recertification Workshops

a. All participants must have satisfactorily completed a prior intersociety or CAOHC workshop.

b. CAOHC strongly suggests an 8-hour minimum presentation for refresher workshops.

* (1) Subject matter to be included shall be items - d, f, g, i, l, n, and o, paragraph 2 above..

(2) Subject items - a, b, c, e, h, k, and p, paragraph 2 above, may be omitted.

c. Ratio of staff and audiometers/student need not apply.

d. Students requiring initial instruction or a heavy concentration of audiometric technique, must take full 20 hour curriculum.

e. It may be possible to schedule those topics required for recertification (indicated above by an asterisk) together in the second and third days of a regular certification workshop. Student requiring recertification only could then reduce their time away from their normal jobs and still qualify.

* Required for refresher workshops

APPENDIX F

Monitoring Audiometry Referral Guide

Reference: TB MED 501

REFERENCE AUDIOGRAM

NO AVERAGE HTL > 25 dB AT 500, 1000 AND 2000 Hz? OR HTL > 55 dB AT 3000, 4000 OR 6000 Hz IN EITHER EAR? YES

PERIODIC AUDIOGRAM

NO THRESHOLD SHIFT ≥ 20 dB AT 1000, 2000, 3000 OR 4000 Hz IN EITHER EAR, RELATIVE TO REFERENCE OR MOST RECENT AUDIOGRAM?

YES

- NOTIFY INDIVIDUAL AND HIS/HER COMMANDER OF HTL SHIFT
- COUNSEL THE INDIVIDUAL ON THE USE OF HEARING PROTECTION
- SCHEDULE 1ST FOLLOW-UP AUDIOGRAM AFTER A MINIMUM OF 15 HOURS OF NO NOISE IN EXCESS OF 75 dBA OR 120 dBP

1ST FOLLOW-UP

AUDIOGRAM

NO THRESHOLD SHIFT ≥ 20 dB AT 1000, 2000, 3000 OR 4000 Hz IN EITHER EAR, RELATIVE TO REFERENCE OR MOST RECENT AUDIOGRAM?

YES

- NOTIFY INDIVIDUAL AND HIS/HER SUPERVISOR OF CONTINUED PRESENCE OF A SIGNIFICANT THRESHOLD SHIFT
- COUNSEL INDIVIDUAL ON THE USE OF HEARING PROTECTION
- SCHEDULE A 2ND FOLLOW-UP AUDIOGRAM AFTER A MINIMUM OF 40 HRS OF NO NOISE IN EXCESS OF 75 dBA OR 120 dBP

2ND FOLLOW-UP

AUDIOGRAM

NO THRESHOLD SHIFT ≥ 20 dB AT 1000, 2000, 3000 OR 4000 Hz IN EITHER EAR, RELATIVE TO REFERENCE OR MOST RECENT AUDIOGRAM?

YES

NOTIFY INDIVIDUAL OF PERMANENT SHIFT IN HTL

ANNUAL HEARING TEST

REFER TO AUDIOLOGIST

APPENDIX G

HEALTH EDUCATION MATERIALS

<u>ITEM</u>	<u>AVAILABLE FROM</u>
1. POSTERS	Commander US Army Environmental Hygiene Agency
a. Those contained in Appendix I, TB MED 501	ATTN: HSHB-OB Aberdeen Proving Ground, MD 21010
b. Audiometric Instructions	USAEHA
2. PAMPHLET - Prevention of Hearing Loss	USAEHA (local reproduction authorized)
3. FILMS	
a. Prevention of Hearing Loss TF 8-4602	Local Audio-visual (AV) Support Centers Use DA Form 4103 (Audio-visual Loan Order)
b. Sound of Sound MF 8-5810	AV Support Centers
c. Stick It In Your Ear MF 8-13077	AV Support Centers
d. S.O.S.	Bilsom International Inc. 11800 Sunrise Valley Drive Reston, VA 22091 (703) 620-3950
e. Listen Up with Norm Crosby	E.A.R. Corporation 7911 Zionsville Road Indianapolis, IN 46168 (317) 293-1111
4. SLIDES	Loaned by USAEHA for local reproduction
5. TECHNICAL GUIDES	
a. Noise Hazard Evaluation, Sound Level Data of Noise Sources, TG 040	USAEHA
b. Personal Hearing Protective Devices; Fitting, Care and Use, TG 041	USAEHA

6. RECORDINGS

- a. With Slides - "How They Hear" Gordon Stowe and Associates
P.O. Box 233
Northbrook, IL 60062
- b. With Filmstrip - "How We Hear" Beltone Electronics Corporation
Beltone Building
4201 West Victoria Street
Chicago, IL 60646
- c. With Slides - "Supervisor
and Employee
Hearing
Conservation
Program" OTO-DATA, Inc.
842 North Highland Avenue NE
Atlanta, GA 30306

APPENDIX H

SUGGESTED ROLE-PLAYING SCENARIOS, HEARING CONSERVATION WORKSHOPS

SITUATION

GOAL

PROPS

- | | | |
|---|--|---|
| <p>1. You are a senior military supervisor. student is subordinate in charge of the 3 students - you have an "inspection" of the ranks and explode.... "These men <u>do not</u> have the same, standard, earplugs.... They detract from the uniform appearance of my unit!"</p> | <p>1. Students should explain that sizing is important, different colors aid in replacement and that a new case is in the system.</p> | <p>1. Three other students...given plastic earplug cases which contain earplugs. No earplugs are similar in size or color. Cases should be worn on uniform.</p> |
| <p>2. You (the patient) ask student to describe hearing loss to you... Should begin to tell you it's a significant <u>hearing loss</u>, when you begin to rub your greedy hands gleefully and exclaim "<u>GREAT!</u> How much <u>money</u> is it worth?"</p> | <p>2. Student should not state percentages nor promise compensation... Explain that procedures must take place to determine eligibility... And make patient consider that money won't repay personal loss of hearing function.</p> | <p>2. Vugraph (Audiogram with high frequency hearing loss).</p> |

SITUATION

GOAL

PROPS

- | | | |
|--|--|--|
| <p>3. You are a shop foreman, with workers (other students) "working" noisily, in noise area. Some are wearing earplugs, others are not. You are a hearing conservationist, begin to tour work area and it's clear that workers aren't protected. Student should call you aside to recommend protection be worn...when you finally do give orders, protection is not put in correctly (not in canals).</p> | <p>3. 1) Students should recognize area/problem.

2) Student should put protection on self <u>OR</u> get out of area...Set example.
3) Student should correct earplug positioning as needed.</p> | <p>3. Two or three other students, earplugs, danger sign, displayed prominently.</p> |
| <p>4. You have just been told that you have noise-related hearing loss. You find audiometric tech, plead with them to look and see the "eardrum's scarring," and recommend a doctor to perform surgery..."To make my hearing better."</p> | <p>4. Tech should recognize that loss is not at eardrum, but in inner ear area; (use terms like sensorineural, cochlea, and permanent)...
<u>NOT</u> possible to correct by surgery.</p> | <p>4. Otoscope</p> |
| <p>5. You are a supervisor of noisy work area, student is hearing conservationist, visiting your work area. You say, "I understand that you've asked to see our hearing protection...everyone's got it - here's <u>mine</u>" (while pulling out the set of new, unused earmuffs).</p> | <p>5. Student should recognize that unused ear muffs haven't protected anyone and cite you lack of enforcement.</p> | <p>5. Ear muffs in box, wrapped in original plastic, hidden from student's view.</p> |

SITUATION

6. You are a shop foreman and student is a hearing conservationist. As you enter work area, student finds that no one is wearing protection. You, the foreman, say "Yeah, I know that they're supposed to be wearing protection but they're adults. If they don't listen to good sense, it's their fault."

7. You are the patient - student has just tested you, obtained audiogram shown on Vugraph. You ask: "How's my hearing?" (You should say something about high-frequency loss and blame it on "ringing ears.")

8. Student is working in hearing conservation, you are senior officer/civilian supervisor who questions the need for hearing conservation...Barging in, you retort, "I don't have time for hearing tests; we have to train to be in combat; we're not going to wear earplugs!"

GOAL

6. Student should recognize and explain legal requirements for supervisor's enforcement of problem.

7. Student should recognize, and explain to you, 7. Vugraph (audiogram with severe high-frequency loss) that tinnitus is a result of hearing loss, not causing it or causing the unwarranted elevation at 4000 Hz.

8. Student should be able to emphasize need for hearing conservation: 8. (? steel pot with high rank insignia)

- Regulatory requirements
- Effect of hearing-impaired soldiers on mission and unit readiness
- (This isn't war, but training)

PROPS

6. Ear muffs in box, with plastic wrap.

9. You are a major unit commander, student is involved in hearing conservation - you ask for brief description of hearing conservation program - after a minute or so, interrupt and say "This hearing conservation business is missing the point. Let's turn down that rock and roll music that troops listen to FIRST!"
 9. Student should control situation by pointing out that commander has responsibility for duty-related noise exposure...while recreation noise is problem, we still have problem on job, and recreational noise shouldn't detract from the job's noise exposure. Besides, awareness from job training regarding noise may influence worker off-duty.
 9. (none)
-
10. You ask student to fit you with earplugs. When student does try to fit you with your appropriate size, wince and grimace about discomfort. ("It hurts! Can't we use a smaller one?")
 10. Student should not try smaller size just because you say your're uncomfortable....should explain need for proper fit.
 10. Variety of earplugs in some type of earplug fitting pack.
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11. You ask student to perform standard air conduction audiometry....as test begins, you start many false positive responses, raise your hand often and constantly... (even stand on chair!) When student stops to reinstruct, say "But I hear something (tinnitus)...What is that?"
 11. Student should:
 - Recognize tinnitus effects
 - Use pulse-tone by manually interrupting stimuli
 - Explain, as simply as possible, tinnitus
 11. Manual audiometer...(without pulse mode switch) or Vugraph of audiometer dial.

SITUATION

GOAL

PROPS

12. You have just been told, by sound level meter measurement, that your operation is 100 dBA - you offer to discontinue use of one of the machines to "make the noise level 50 dBA...Half of the original noise level and less than 85 dBA."

12. Student should recognize that the noise levels aren't halved, but will only go down a small amount. (Not critical to describe formula)

12. a. Two items (chairs, boxes, etc) that you announce are "Noise machines in your shop."

b. Sound level meter.

13. You tell student that you want the earphones exchanged from an unused audiometer ("in the closet") to the "nice audiometer" that now has a set of broken earphones.

13. Student should refuse to exchange earphones, recognizing that the audiometer would lose its calibrated status if its earphones were replace with a different set.

14. You are a patient, student is a hearing conservationist. Student should be asked to describe audiogram. As he/she mentions high frequency hearing loss, you interject: "I know that the hearing loss isn't really there...Why, I heard all kinds of things through the walls of the testing booth. If the booth was guleter, my hearing test would be normal!"

14. Student should explain that low frequency thresholds are affected by background noise, not such high frequency thresholds as shown on the audiogram and should explain that the booth is sound-treated -- does not have to be soundproof.

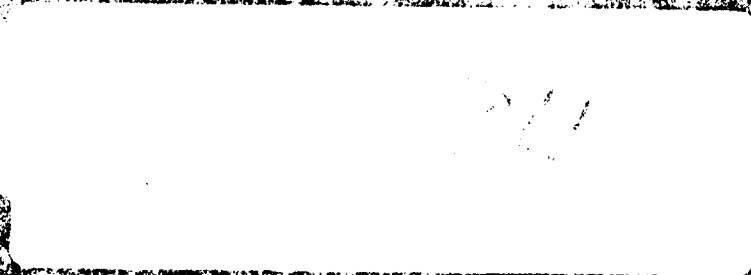
14. Vugraph (Audiogram with high-frequency loss).

<u>SITUATION</u>	<u>GOAL</u>	<u>PROPS</u>
15. You are a worker with severe high-frequency hearing loss; student is a hearing conservationist. You say: "My father lost <u>his</u> hearing when he got old, so I suppose I'm going to lose <u>mine</u> too!"	15. Student should urge you to protect your hearing...since hearing doesn't have to decrease with aging ("Did father work in noise?")	Vugraph (Audiogram with high-frequency hearing loss).
16. You are a military patient, student is a hearing conservationist. You ask student "What does this test show, compared to the first test?", and "What do I do now?"	16. Student should, among other things, - Recognize the "STS:YES" condition - Ask you to return for follow-up #1 and wear protection.	16. Vugraph: (Audiogram overlay with "STS:YES") (DD 2216).
17. You are a hearing conservationist's supervisor...the student is holding some DD Forms 2216. You say, "We should use <u>last</u> year's audiogram as the reference audiogram, not any earlier years...That prevents any natural hearing loss due to aging from influencing the results."	17. Student should be able to discuss the importance of long-term comparisons between <u>current</u> and <u>baseline</u> hearing status.	17. DD Forms 2216.
18. Audiogram shows 0 dB thresholds in good ear, +110 dB threshold in poor ear. You ask student to comment on audiogram.	18. Student should recognize that crossover didn't occur...patient motivation/cooperation of faulty equipment may be causing questionable results.	18. Vugraph: (Audiogram showing unilateral deafness, without crossover).

<u>SITUATION</u>	<u>GOAL</u>	<u>PROPS</u>
<p>19. You are a patient - student has just tested you, obtained results shown on Vugraph. Acknowledging that you have a high frequency loss, you ask, "What should I do about my hearing?" Student should start recommending use of hearing protection...Interrupt abruptly and say "Yeah, yeah, but I've already <u>lost</u> my hearing-why should I protect it <u>now</u>?"</p>	<p>19. Student should recognize, (and explain to you) need to protect remaining hearing.</p>	<p>19. Vugraph: (Audiogram shows severe high frequency loss).</p>
<p>20. You are visiting with a hearing conservation technician...You "Have an Idea"--and suggest that your clinic test everyone on post and send all audiogram copies to USAEHA... Just to be sure that records are on file for everyone (Including secretaries, office workers, etc.)</p>	<p>20. Student should recognize that this idea is not consistent with TB MED 501 and would unnecessarily overburden testing and record keeping system.</p>	<p>20. Copy of DD Forms 2215 and 2216.</p>
<p>21. You are a student's boss on Monday... Ask student to explain why he/she's asking for "All these fancy DD Forms; Why aren't our SF 88's good enough to use as audiograms any more?"</p>	<p>21. Student should be able to explain forms' use...HEARS...Reference system.</p>	<p>21. (none)</p>

END

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